

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
12 April 2007 (12.04.2007)

PCT

(10) International Publication Number
WO 2007/039319 A2

(51) International Patent Classification:
C12Q 1/68 (2006.01)

(21) International Application Number:
PCT/EP2006/010132

(22) International Filing Date:
29 September 2006 (29.09.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
05109025.6 29 September 2005 (29.09.2005) EP

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(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ANALYTICAL DEVICE FOR RAPID IDENTIFICATION OF PATHOGENS

(57) Abstract: The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.



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Analytical device for Rapid Identification of Pathogens

The present invention provides an analytical device, especially a DNA microarray, for identification and characterisation of microorganisms in a sample or clinical specimen. Furthermore, it provides for a method for rapid identification and strain profiling of different microbial species in a sample or clinical specimen, especially in a blood culture, utilizing said analytical device.

Background

Isolation, identification and characterisation of bacteria and fungi from such diverse samples like food, environmental samples, clinical specimens, and veterinary samples is still a challenge for today's analytical laboratories. This is due to the fact that generally the identification of microorganisms includes three steps: (a) enrichment of microorganisms by culture, (b) subculture on solid media (preparation of a pure culture), and (c) performing a set of biochemical reactions specific for a particular pathogen. All these steps are dependent on the bacterial growth (slow), they are poorly automated (lot of manual work), and complex (require well educated personal).

Isolation, identification and characterisation of bacteria and fungi from clinical specimens is a main task of microbiological routine diagnostics. In fact, microorganisms are ubiquitous in certain areas of the human body. For this reason isolation and identification of pathogenic bacteria from clinical material and discrimination of specific pathogens from contaminations with indigenous or environmentally encountered microorganisms is a requirement for the correct diagnosis of infectious diseases. Additionally, accurate identification of antibiotic resistance and particular virulence factors provide important information enabling the clinician to choose effective antimicrobial therapy.

In the course of infection, many specimen types can be used for direct identification of the pathogens. These include, but are not limited to, liquor in the course of bacterial meningitis, sputum from patients with bacterial pneumonia, urine in the course of upper and lower urinary tract infections, punktate from sites of deep purulent infections (such as abscess, phlegmone, lung emphysema and septic arthritis), stool from patients with gastrointestinal tract infections, pus, swabs or wound fluid from purulent infections of the skin and wounds. Sometimes, bacteria

are represented in the specimen only in minor numbers, thus, indirect identification of pathogens after culture of specimens in liquid media is employed. Important examples are enrichment cultures of food samples during outbreaks of food borne infections and blood cultures for diagnosis of bloodstream infections.

- 5 The invasion of the bloodstream by microorganisms, especially bacteremia and fungemia, represents one of the most serious consequences of infections and is a high ranked cause of death (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-465 (1997)). Bacteremia is the means by which local infections spread
10 hematogenously to distant organs. This hematogenous dissemination of bacteria is part of the pathophysiology of, e.g., meningitis and endocarditis, Pott's disease and many other forms of osteomyelitis. In the hospital, indwelling catheters are a frequent cause of bacteremia and subsequent nosocomial infections, since they provide a means by which bacteria normally found on the skin can enter the
15 bloodstream. Other causes of bacteremia include dental procedures, urinary tract infections, intravenous drug use, and colorectal cancer.

- Systemic fungal infection is becoming more and more common in modern hospitals. The most common fungal infections are candidiasis and aspergillosis, but other systemic fungal infections such as Histoplasmosis, Blastomycosis,
20 Coccidioidomycosis and Cryptococcosis are also of increasing relevance. Systemic fungal infections in hospitals are commonly seen in immune compromised patients and - like bacteremia - in patients with indwelling catheters. Due to underlying serious illnesses and possible resistance of the pathogens to antifungal agents, patients with systemic fungal infections often have poor clinical outcomes.
25 Infections due to *Candida* species are the fourth most important cause of nosocomial bloodstream infection.

- Bacteremia is operationally defined as the presence of viable bacteria as evidenced by positive blood cultures. Fungemia is similarly defined as the presence of viable fungi as evidenced by positive blood cultures. When bacteremia or fungemia occurs
30 in the presence of systemic symptoms (such as fever or chills) the condition is designated as sepsis; and in the setting of more severe disturbances of

temperature, respiration, heart rate or white blood cell count, is characterised as systemic inflammatory response syndrome (SIRS).

Many septic episodes are nosocomial and often due to microorganisms with increased and multiple antimicrobial resistance. *Staphylococcus aureus*, *Escherichia coli*, Coagulase-negative staphylococci (CoNS), *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Enterococcus* spp., *Streptococcus* spp., *Candida albicans* and *Enterobacter cloacae* are the most frequent etiological agents of bacteremia and fungemia in Europe (Decousser, J. W. et al., J. Antimicrob. Chemother. 51:1214-22 (2003); Lyytikainen, O. et al., Clin. Infect. Dis. 35:314-9 (2002); Reacher, M.H. et al., BMJ 320:213-6 (2000); Rosenthal Kreuberger, E.J., Int. J. Antimicrob. Agents 24:196-8 (2004)) and the USA (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-82 (2001); Reimer, L.G. et al., Clin. Microbiol. Rev. 10:444-65 (1997); Reisner, L.G. et al., J. Clin. Microbiol. 37:2024-6 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-13 (1999)).

Nosocomial bacteremia and especially sepsis require an immediate antibiotic therapy, even when the causative bacteria are still unknown. Thus, said therapy has to be performed as empirical initial therapy (Rello, J. et al., Intensive Care Med. 20:94-98 (1994)), which covers the complete spectrum of relevant pathogens. However, the increase of bacterial resistance lowers the chance of success for such empirical antibiotic treatments considerably (Mylotte, J.M. and Tayara, A., Eur. Clin. Microbiol. Infect. Dis. 19:157-163 (2000); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). This primary therapy can only be replaced by a specific treatment after a thorough microbial diagnosis which usually takes 76-120 h (Bourbeau, P.P. and Pohlman, J.K., J. Clin. Microbiol. 39:2079-2082 (2001)). A fast track diagnosis which shortens this lag time would increase the chance of therapy success.

Rapid and reliable detection of bloodstream infections, including characterisation of the pathogen to the species level and determination of its antibiotic susceptibility pattern, is crucial for several reasons: (i) Appropriate antimicrobial agents can be selected, and thus, unnecessary treatment with ineffective antibiotics can be avoided; (ii) the prognosis of the patients can be improved; (iii) the acquisition of resistances in pathogens may be decelerated and (iv) expenditures on antimicrobials and overall hospital costs can be reduced (Barenfanger, J. et al., J.

Clin. Microbiol. 37:1415-8 (1999); Doern, G.V. et al., J. Clin. Microbiol. 32:1757-62 (1994); Trenholme, G.M. et al., J. Clin. Microbiol. 27:1342-5 (1989); Wheeler, A.P. and Bernard, G.R., N. Engl. J. Med. 340:207-14 (1999)). Therefore, there is a strong need for rapid tests for specific and sensitive identification of bacteria and pathogenic fungi directly from blood cultures.

The diagnosis of bacteremia commonly relies on blood cultures where the growth of microorganisms is continuously monitored by automated devices (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Wilson, M.L. et al., J. Clin. Microbiol. 37:1709-1713 (1999)). Although such continuous-reading and computed systems decrease the time for detection of positive blood cultures, definitive pathogen identification from positive blood cultures still requires traditional Gram-staining, sub-culturing and susceptibility testing, delaying the identification of pathogens for one to three days (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003); Oliveira, K. et al., J. Clin. Microbiol. 40:247-251 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). The subculture procedure with subsequent species identification and determination of antibiotic resistance is time-consuming and elaborate. The biochemical and immunological assays like testing with coagulase, nuclease or latex agglutination are not always reliable. Antigenic and biochemical variations of bacteria grown in blood culture, inhibitory action of blood culture medium components as well as the presence of more than one microbial species may mislead data interpretation.

Staphylococci are the most important and frequent group of pathogens growing in blood culture, responsible for 30% to more than 50% of all bacteremia events (James, P.A. and Al-Shafi, K.M., J. Clin. Pathol. 53:231-233 (2000); Reisner, B.S. and Woods, G.L., J. Clin. Microbiol. 37:2024-2026 (1999); Velasco, E. et al., Sao Paulo Med. J. 118:131-138 (2000)) with a mortality rate ranging from 13 to 50% (McClelland, R.S. et al., Arch. Intern. Med. 159:1244-1247 (1999); Rello, J. et al., Intensive Care Med. 20:94-98 (1994); Weinstein, M.P. et al., Clin. Infect. Dis. 24:584-602 (1997)). The emergence of *S. aureus* strains with multiple resistance to antibiotics makes empirical therapy prone to fail (Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)). *S. aureus* is generally regarded as a virulent

pathogen, whereas CoNS are either considered as a cause of catheter-associated nosocomial bacteremia or, more frequently, as blood culture contamination. Thus, a sub-genus identification of gram-positive cocci in clusters (CPCC) is of great clinical significance (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)).

- 5 Methods used up to date for direct identification of *S. aureus* growing in blood culture bottles include biochemical tests, like detection of thermostable nuclease or tube coagulase test, or commercial antibody-based kits connected with the disadvantages listed above.

Besides *S. aureus* and coagulase-negative staphylococci, *E. coli*, *Klebsiella* spp.,
10 *Enterobacter* spp., *Proteus* spp., *Pseudomonas aeruginosa*, *Streptococcus pneumoniae*, beta hemolytic Streptococci and *Enterococcus* spp. belong to the most frequent reported pathogens causing bacteremia (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Reacher, M.H. et al., BMJ, 320:213-6 (2000); Lyytikainen, O. et al., Clin. Infect. Dis., 35:e14-9 (2002)) In order to reduce the
15 time needed for identification and susceptibility testing, the possibility of combining an automated blood culture system with an automated identification and susceptibility testing system by direct inoculation from positive blood cultures has been studied for gram-positive cocci as well as for gram-negative rods by several groups of investigators, but with varying success (Reimer, L.G. et al., Clin.
20 Microbiol. Rev., 10:444-65 (1997); Hansen, D.S. et al., Clin. Microbiol. Infect., 8:38-44 (2002); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)). Although the authors saw some potential of the combined system to allow the agar isolation step to be skipped, the system is hampered by the fact that (i) the blood culture sample
25 has to undergo a time-consuming separation procedure for the enrichment of bacterial cells, (ii) the identification rate varies depending on the employed identification system and (iii) the performance is not equally good for gram-negative and gram-positive pathogens (Reimer, L.G. et al., Clin. Microbiol. Rev., 10:444-65 (1997); Ling, T.K. et al., J. Clin. Microbiol., 41:4705-7 (2003); Funke, G. and
30 Funke-Kissling, P., J. Clin. Microbiol., 42:1466-70 (2004)).

Considerable progress was made using nucleic acid-based methods for the identification and genotyping of bacteria or fungi in blood specimens. Assays employing ribosomal RNA-based oligonucleotide probes like fluorescence *in situ*

hybridisation (FISH) (Chapin, K. and Musgnug, M., J. Clin. Microbiol. 41:4324-7 (2003); Jansen, G.J. et al., J. Clin. Microbiol. 38:814-7 (2000); Kempf, V.A. et al., J. Clin. Microbiol. 38:830-8 (2000); Oliveira, K. et al., J. Clin. Microbiol. 41:889-91 (2003)) or microarrays (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-8 (2000);
5 Marlowe, E.M. et al., J. Clin. Microbiol. 41:5127-33 (2003); Sogaard, M. et al., J. Clin. Microbiol., 43:1947-9 (2005)) provide for rapid species identification in blood cultures. However, methods solely based on ribosomal RNA probes allow species identification only, and do not provide information on antibiotic susceptibility and other strain specific characteristics (e.g. virulence genes). For the molecular
10 detection of antibiotic resistances in staphylococci, several multiplex PCR-based assays were described (Martineau, F. et al., Antimicrob. Agents Chemother. 44:231-8 (2000); Shrestha, N.K. et al., Approved standard M2-4A, Villanova, PA (1990); Strommenger, B.C. et al. J. Clin. Microbiol. 41:4089-94; Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-31 (2001)). Several groups have successfully identified *S.*
15 *aureus* and more specifically methicillin-resistant *S. aureus* strains (MRSA) from blood cultures by using DNA probes (Levi, K. and Towner, K.J., J. Clin. Microbiol. 41:3890-3892 (2003); Poulsen, A.B. et al., J. Antimicrob. Chemother. 51 :419-421 (2003)), peptide nucleic acid probes (Oliveira, K. et al., J. Clin. Microbiol. 41:889-891 (2003)), multiplex PCR (Mason, W. J. et al., J. Clin. Microbiol. 39:3332-3338
20 (2001)), gel-based PCR (Krishnan, P.U. et al., J. Clin Pathol. 55:745-748 (2002)), and real-time PCR (Shrestha N.K. et al., J. Clin. Microbiol. 40:2659-2661 (2002); Tan, T.Y. et al., J. Clin. Microbiol. 39:4529-4531 (2001)).

However, the use of such molecular assays suffers from two main restrictions: First, they rely on a pre-identification of the pathogen since their discriminatory
25 capacity is technically limited, for instance by the number of fluorochromes available for labelling the probes or, in the case of multiplex PCR, by the capacity of resolution in gel electrophoresis. These molecular assays are thus usually not scalable and unfit for high throughput analysis.

The last years have witnessed the emergence of many DNA microchip projects
30 arraying genes of microorganisms (Ye, R.W. et al., J. Microbiol. Methods 47:257-272 (2001)). They can detect tens of thousands of DNA sequences in a single hybridisation step (DeRisi, J.L. et al., Science 278:680-686 (1997); Duggan, D.J. et al., Nat. Genet. 21:10-14 (1999); Lashkari, D.A. et al., Proc. Natl. Acad. Sci. USA

94:13057-13062 (1997)). Originally developed for gene expression profiling, DNA sequence analysis and genotyping, microarrays were recently also used to identify viral (Wang, R.F. et al., FEMS Microbiol. Lett. 213:175-182 (2002)) and bacterial (Bekal, S. et al., J. Clin. Microbiol. 41:2113-2125 (2003)) pathogens in environmental and clinical samples.

Most of the published reports employed oligonucleotide microarrays containing a reduced number of spotted probes and representing a single bacterial species only (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003); Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)). Such arrays were used to identify pathogenic strains belonging to a pre-identified species (Chizhikov, V. et al., Appl. Environ. Microbiol. 67:3258-3263 (2001)), to distinguish between species of the same genus (Volokhov, D. et al., J. Clin. Microbiol. 41:4071-4080 (2003); Volokhov, D. et al., J. Clin. Microbiol. 40:4720-4728 (2002)) or to detect genes encoding resistance to a certain antibiotic (Volokhov, D. et al., J. Appl. Microbiol. 95:787-798 (2003)).

Further microarrays for detection of bacteria and fungi are known in the art (Nakamura, M. et al., Abstracts of the general meeting of the American society for microbiology, abstract No C219 (2003); Wang, R.-F. et al., Molecular and Cellular Probes 223-224 (2004); Lehner, A. et al., FEMS Microbiol. Lett. 133-142 (2005); EP 1310569; WO 92/07096; US-B1-6,747,137). However, all these microarrays have in common the use of short oligonucleotides with a maximum length of 40 nt ("short oligonucleotides"). They are short-oligonucleotide microarrays. Although such short-oligonucleotide microarrays could be rapidly designed and built up they carry some intrinsic disadvantages: like all methods based on single and often short DNA sequences they show reduced reliability and sensitivity (Stears, R.L. et al., Nat. Med. 9:140-145 (2003)). To palliate the high probability of non-specific hybridisation due to the short size (20-40 bp) of the oligonucleotides it is necessary to design many partially overlapping oligonucleotides in order to confirm the presence of a gene. This consequent increase in complexity makes it extremely difficult to set up the optimal hybridisation conditions necessary for producing trustful results. Moreover, surface-bound short oligonucleotides have poor hybridisation properties and are highly sensitive to single nucleotide polymorphisms (Hughes, T.R. et al., Nat. Biotechnol. 19:342-347 (2001)). For these reasons,

oligonucleotide microarrays using oligonucleotides with a maximum length of 40 nt are unsuitable for routine diagnostics.

Up to now, diagnosis of bacteremia by microarrays is limited to species identification by oligonucleotides for 23S and 18S RNA sequences, which is still strictly experimental (Anthony, R.M. et al., J. Clin. Microbiol. 38:781-788 (2000)) and carries along the methodological weakness associated to the use of short oligonucleotides as hybridisation probes.

A DNA microarray employing capture probes of more than 40 nt length amplified by PCR was described by Fitzgerald et al. (Fitzgerald, J.R. et al., Proc. Natl. Acad. Sci. USA 98(15):8821-8826 (2001)). To investigate molecular population genetics of *Staphylococcus aureus* on a genome scale, a microarray comprising 2817 complete ORFs of *S. aureus* strain COL was constructed, representing >90% of the *S. aureus* genome. The microarray was able to discriminate 36 *S. aureus* strains. However, since it was not designed for the identification of different bacterial species, it was not tested for possible cross reactions with other bacteria besides *S. aureus*. Due to the conservative nature of many house-keeping proteins and genes, respectively, cross reactions of the microarray with CoNS strains and other bacterial species will occur. Unspecific cross reactions combined with the high number of probes (2817) result in a high complexity of the microarray data, not applicable to routine diagnostics. Furthermore, PCR amplification of long ORFs is a difficult procedure, in particular for bacteria with DNA of high GC-content.

The aim of present invention is to provide a gene-segment based analytical device, especially a microarray, for species specific identification and characterisation of different microorganisms, especially different bacteria and pathogenic fungi, present in a sample or clinical specimen which does not possess the drawbacks of the short-oligonucleotide microarray as outlined above. Said device/microarray must allow the specific identification of the target species and should furthermore allow the differentiation (i.e. distinguish) between different target microorganisms present in the sample or clinical specimen. It must furthermore provide a high reliability and sensitivity of detection.

Summary of the Invention

The present invention provides an analytical device, which is preferably a DNA microarray, for the identification and characterisation of microorganisms in

biological samples, especially of microorganisms connected with bacteremia, fungemia and sepsis. Species specific gene probes in this device/microarray allow the identification of different microbial species, whilst antibiotic resistance and virulence gene probes allow for the genotypic discrimination within a species. The
5 device/microarray can be designed to allow species identification, virulence determination and resistance determination independently from each other or simultaneously, and furthermore said determinations can be performed for one or more different microbial species and strains with one device/microarray. Furthermore, different microbial species and strains are discriminated, even in a
10 polymicrobial sample (specimen with more than one pathogen).

The device/DNA microarray according to present invention thus demonstrates the feasibility of simultaneously identifying and characterising different microbial species in a sample or clinical specimen, especially in blood samples, without prior PCR amplification of target DNA or pre-identification of the pathogen. This can
15 reduce sample processing time to a single day and less.

The invention furthermore provides a method for rapid identification and characterisation of microorganisms, especially of bacteria, yeasts and filamentous fungi, using the device/microarray of the invention. The method is quick, can be automated, leads to reproducible results and allows an early choice of specific
20 antibiotics for treatment of bacteremia, fungemia or sepsis.

In particular, the present invention provides

(1) an analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences
25 or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt);

(2) the use of the analytical device as defined in (1) above for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen,
30 preferably in a clinical specimen, more preferably for the diagnosis of a clinical condition, most preferably for the diagnosis of bacteremia, fungemia or sepsis;

(3) an *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

- (a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule, preferably a fluorochrome;
- (b) applying the DNA thus obtained to the analytical device as defined in (1) above and hybridising the DNA with the gene probes of the device; and
- 5 (c) detecting DNA bound to the device by determination of the amount of the reporter molecules bound to the device; and
- (4) a kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of embodiment (1).

Brief description of the Figures

10 Fig. 1: DNA microarray analyses of 58 clinical isolates, reference strains and blood cultures.

Each column shows the results of an individual hybridisation with target DNA prepared from: *S. aureus* ATCC 29213 (1), MW2 (2), clinical isolates (3-7), positive blood cultures (8-11); *P. aeruginosa* ATCC 27853 (12), clinical isolates (13-17),
 15 positive blood culture (18); *E. coli* ATCC 25922 (19), clinical isolates (20-25), positive blood cultures (26-27); *S. epidermidis* clinical isolates (28-32), positive blood cultures (33-35); clinical isolates of *S. auricularis* (36), *S. capitis* (37), *S. haemolyticus* (38), *S. hominis* (39), and *S. warneri* (40). Other Gram-negative species included a *Proteus mirabilis* positive blood culture (41), clinical isolates of
 20 *Proteus mirabilis* (42-43), *Serratia marcescens* (44-45), *Klebsiella pneumonia* (46-48), *Stenotrophomonas maltophilia* (49), *Acinetobacter baumannii* (50), *Enterobacter cloacae* (51) and *Enterobacter aerogenes* (52); other Gram-positive species included clinical isolates of *Micrococcus* spp. (53), *Enterococcus* spp. (54), *Enterococcus faecalis* (55) and *Streptococcus pneumoniae* (56) and two positive
 25 blood cultures of *S. pneumoniae* (57-58).

(A) Hybridisation of DNA prepared from bacterial isolates, reference strains and blood cultures with *E. coli* gene probes;

(B) hybridisation with *P. aeruginosa* gene probes;

(C) hybridisation with *S. aureus* gene probes.

30 Grey boxes represent gene probes which hybridised with the respective target DNA, white boxes represent gene probes which showed no hybridisation with the respective target DNA.

Fig. 2: Validation of the *S. aureus* microarray of example 1.11. 2 µg genomic DNA from *S. aureus* strain T94 were labelled either with Cy3 or Cy5, combined and hybridised as described in Example 1.11. Cy3: green signal; Cy5: red signal; double-hybridisation: yellow signal.

- 5 A) Overlay of microarray scanned using Cy3 and Cy5 filter sets;
B) Scatterplot of normalized fluorescence intensities of individual gene probes after microarray hybridisation. The signal intensities from both channels correlate highly with each other ($r^2 = 0.97$).

Fig. 3: Specific identification of *S. aureus* from distantly related bacteria using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of pure *E. coli* (A) or *P. aeruginosa* (B) genomic DNA. Obtained hybridisation patterns are represented as bar codes, where the 140 spotted gene segments appear subsequently and are clustered in categories (NC: negative control; PC: positive control; Antibiotic Resistance Determinants; Virulence Factors and Metabolic Functions (see Tab. 6)). Positive hybridisation is indicated by a bar while negative spots are represented by an empty area. Both assays show clear *S. aureus* discrimination with practically no cross hybridisation between DNA from said gram negative bacteria and *S. aureus* selected genes, while the positive control (16S RNA sequence) reveals the good quality of hybridisation.

20 Fig. 4: Specific identification of *S. aureus* from coagulase negative staphylococci using the microarray of example 1.11. 2 µg of *S. aureus* DNA were co-hybridised with 2 µg of *S. epidermidis* (A) or *S. saprophyticus* (B) genomic DNA. Obtained hybridisation patterns are illustrated by scanned fluorescent picture data (A: *S. aureus*: green signal; *S. epidermidis*: red signal; B: *S. aureus*: red signal; *S. saprophyticus*: green signal) and transformed in bar codes (see legend of Fig. 3).
25 All specific *S. aureus* virulence factor genes hybridised exclusively with *S. aureus* DNA. Yellow spots showing cross-hybridisation correspond to some shared antibiotic resistance determinants and genes associated to metabolic functions.

Fig. 5: Specificity of the *S. aureus* microarray of example 1.11.

- 30 A) Scan of microarray hybridised with 2 µg each of genomic DNA from *S. aureus* strain T103 (Cy3, represented in green) or T100 (Cy5, represented in red), showing remarkable genotypic differences between strains.

B) PCR amplification of the genes from genomic DNA of *S. aureus* (strains T100 and T103) validating results of the microarray hybridisation shown in (A).

Fig. 6: Identification and characterisation of *S. aureus* from positive blood culture using the microarray of example 1.11.

- 5 2 µg of DNA prepared from blood culture positive for *S. aureus* (strain T95) was co-hybridised with 2 µg of DNA prepared from sterile blood culture or with 2 µg of pure *S. aureus* genomic DNA for 4 hours. Positive and negative spots are transformed in a bar code scheme (see legend of Fig. 3).

Sterile blood culture DNA did not cross-hybridise with spotted *S. aureus* genes (A).

- 10 Blood culture positive for *S. aureus* produced a fluorescent hybridisation pattern almost identical to the pattern obtained with pure *S. aureus* genomic DNA (B).

Fig. 7: Hybridization profiles obtained in Example 2 after microarray hybridization with DNA obtained from six bacterial target strains: (A) *S. aureus* ATCC 29213, (B) *S. epidermidis* BC 1920, (C) *S. pyogenes* DSM 11723, (D) *S. pneumoniae* ATCC
15 49619, (E) *E. faecalis* UW 700700/95, (F) *E. faecium* VRE9182 and two non-target strains: (G) *E. casseliflavus* UW703/95 and (H) *S. angiosus* DSM 20563.. Each bar represents the fluorescent signal of one capture probe. Fluorescent signals of the 930 probes represent the median intensity of four spots from which the local background was subtracted. Probe IDs are given in Table 8.

- 20 Fig. 8: Specificity of the microarray for *Candida albicans* in Example 2. (A) Hybridization profile obtained for *C. albicans* ATCC 10231. (B) Specificity of two *C. albicans* capture probes. Hybridization signals were determined for the two probes after hybridization with DNA obtained from 44 different microbial strains (see Table 9 for strain identification).

- 25 Fig. 9: Specificity of selected capture probes for (A) *Klebsiella oxytoca*, (B) *K. pneumoniae*, (C) *Proteus vulgaris* and (D) *P. mirabilis* does allow species discrimination. Fluorescence intensities refer to hybridization signals obtained for the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

- 30 Fig. 10: Specificity of selected capture probes for the coagulase-negative staphylococci (A) *S. epidermidis*, (B) *S. haemolyticus*, (C) *S. warneri* and (D) *S. saprophyticus*. Fluorescence intensities refer to hybridization signals obtained for

the respective probes after hybridization with DNA isolated from 44 different microbial strains (see Table 9 for strain identification).

Definitions

- 5 In the framework of the present invention the following terms and definitions are used.

An "analytical device" in the context of present invention is any solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes microtiter
10 plates coated with one or several DNA gene probes per well, glass surfaces (like, e.g., microscopic slides) with DNA spots, filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads may be used in a multi-chamber system, preferably in a microfluidic multi-chamber system, wherein
15 each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also
20 attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Vice versa, beads made of a magnetic material could be attached to an iron surface.

The analytical device of present application is preferably a DNA microarray, a
25 (magnetic) bead or set of beads coated with DNA probes or a microtiter plate coated with DNA probes. More preferred it is a (magnetic) bead or set of beads coated with DNA probes or a DNA microarray. In the most preferred aspect of present invention it is a DNA microarray.

A "DNA microarray" consists of a collection of nucleic acid sequences, preferably
30 DNA sequences, immobilized onto a solid support, such as glass, plastic or silicon chips, in a latticed pattern (forming an "array"). Each unique sequence of said sequences forms a tiny feature on the microarray called a "spot" or "capture probe". The size of these spots varies from one system to another, but is usually

less than two hundred micrometers in diameter, thus up to tens of thousands of spots can be arrayed in a total area of a few square centimeters. DNA microarrays provide a means to detect and quantify large numbers of discrete nucleic sequences in parallel. In a microarray hybridisation the nucleic acids in the sample that is being analysed (called "target") are expected to form duplexes specifically with the corresponding capture probes. Occurrence or absence of duplex formation indicate the presence or absence of said target. For routine microarray analysis, said target is commonly converted to a labelled population of nucleic acids, using reporter molecules. Hybridisation of said labelled target DNA molecules from the tested samples with complementary DNA sequences affixed in specific spots on the array can thus be detected by examination for the presence of said label on the array using a microarray scanner (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays", Spektrum Akademischer Verlag, Heidelberg (2004)).

In the following, the invention is exemplified for a DNA microarray (synonym: "array"). The invention can, however, also be performed using any other of the analytical devices as listed above.

"Gene probe" or "gene probe derived from..." refers to a DNA sequence present on the microarray of present invention and used as a capture probe. It is a DNA segment (see below) which is complementary to a target DNA sequence, preferably to a microbial, more preferably to a bacterial or fungal gene or gene segment. Said gene probe is prepared by any known method of DNA synthesis, and preferably prepared by cloning the respective PCR-amplified gene or gene segment into a plasmid/vector. The recombinant gene or gene segment is then amplified by PCR, isolated from the amplification mix, purified (preferably by ethanol-purification) and finally spotted onto the array.

An "isolate" is a microbial, especially a fungal or bacterial strain isolated from a given specimen, wherein the isolation includes at least one *in vitro* propagation.

A "clinical isolate" is an isolate from a clinical specimen.

"Coagulase-negative staphylococci" ("CoNS") are bacteria of the genus *Staphylococcus* which are negative for a bacterial coagulase (do not induce clotting of a serum). These are all *Staphylococci* with the exception of *S. aureus*. Preferred CoNS in the context of present invention are *Staphylococcus epidermidis*,

Staphylococcus haemolyticus, *Staphylococcus lugdunensis* and *Staphylococcus warneri*, of which *Staphylococcus epidermidis* is especially preferred.

An "isolated DNA" is a DNA separated or purified from the organism it is naturally associated with or from the clinical specimen in which it occurs. This comprises
5 biochemically or biophysically purified native DNA, recombinant DNA, chemically synthesized DNA and DNA analogues (e.g. peptide nucleic acids).

"Native" is synonymous to "naturally (occurring)".

A "DNA segment" or "gene segment" is an isolated DNA which contains or consists of a part of the native full-length sequence of a gene which is still able to hybridize
10 to the native sequence under stringent hybridisation conditions. Although the present invention is in the following exclusively described as relating to "DNA" sequences, it is not to be construed as being limited thereto. Rather, if the term "DNA" is used in connection with the gene probes or target sequences of present invention, it includes other polynucleotides (like RNA or RNA/DNA hybrids), and
15 DNA analogues such as PNA, phosphonate backbone DNA, artificial pentose or hexose backbone DNA which is able to hybridize with native DNA etc.. Furthermore, modified bases like deoxy bases, inosine or aminoallylcytosine may be used on all DNA, RNA and PNA backbones. However, DNA itself is the preferred polynucleotide for performance of the invention.

20 The DNA sequences used as gene probes in present invention are either identical, substantially identical or homologous to the complementary native target sequences (i.e. they are "derived from" said target sequences). In the context of present invention, when a specific DNA sequence is denominated, this encompasses not only said specific sequence, but also the sequences substantially identical or
25 homologous thereto, i.e. its substitution mutants. "Substantially identical" means that the DNA contains mutations of up to 10% of the total number of nt in comparison with the native DNA sequence and/or has a nucleotide identity of > 90% to the corresponding native DNA segment. Said mutations are preferably single nucleotide polymorphisms or point mutations and include the mutation of not
30 only a single but also a few (up to 10 nt, preferably up to 5 nt) consecutive nt. "Homologous" or "homologue" refers to a DNA sequence which has a sequence identity of more than 70% of the corresponding native DNA sequence and encompasses the substantially identical DNA sequences. Preferably, the sequences

used as gene probes are at least substantially identical to the corresponding native DNA sequence.

Preferred gene probes of the present invention are the DNA sequences listed in the sequence protocol, their complementary sequences or their corresponding native
5 DNA segment.

The DNA sequences used as gene probes in present invention may also be deletion or addition mutants of the corresponding native DNA segments. In case of deletion mutants, the minimum length of the DNA sequences suitable as probes in present invention is 100 nt. Preferably, the deletions take place at the 5'- and/or 3'-
10 terminus of the native DNA segment. In case of addition mutants, the added nucleotides may sum up to a total of 90% of the nucleotide number of the native DNA segment, if added at the 5'- or 3'-terminus of the DNA sequence. Alternatively, the additions and deletions may be of one isolated nucleotide or of 2 or more consecutive nucleotides at one or more internal site(s) of the native DNA
15 segment. Preferably, 0-30% nucleotides of the corresponding native DNA segment are added or deleted. It is most preferred that the addition or deletion mutants used as gene probes in present invention comprise one or more segment(s) of at least 100 consecutive nt each, which are derived from one gene, and/or sequences homologous (70% homology) or complementary thereto. These segments may be
20 embedded in or fused to other DNA sequences, which will not hybridize under stringent conditions with either human or bacterial DNA or the DNA of the target microorganism. Said other DNA sequences preferably have a maximum length which adds up with the length of the enclosed segment(s) to not more than the upper limit for the length of gene probes suitable for present invention.

25 A "positive blood culture" is an *in vitro* culture started from whole blood or blood components wherein the growth of microorganisms has been detected. Said growth is indicated by a positive growth index. The detection is preferably done by monitoring CO₂ production in the blood culture.

"Direct identification" of microorganisms refers to an identification method which
30 comprises isolation of DNA from a sample or clinical specimen, but does not require an amplification of the genetic material of the microorganisms after said isolation in order to identify the microorganisms using the method of present invention. The isolated genetic material is labelled and applied to the DNA microarray of present

invention without prior amplification, i.e. directly after isolation or after a short workup step.

„Species-specific“ probe(s) means that a species can be identified specifically and unambiguously using said probe or set of probes.

- 5 “Differentiation” means the discrimination among distinct and different species, genera or groups of pathogens.

A “detection method” in the context of the present invention is a method for determination of hybridisation of DNA molecules contained in a sample to the probes on the solid support of the microarray of present invention. This method
10 may be any textbook method for detection of DNA hybridisation on microarrays, e.g. direct detection or labelling of target DNA with a reporter molecule and consecutive visualisation of the reporter molecule. Preferred detection methods are said labelling method and the direct detection by electrical biosensors or mass spectrometry (Liu, R. H. et al., Anal. Chem. 76(7):1824-31 (2004); Stomakhin, A.
15 A. et al., Nucleic Acids Res. 28(5):1193-8 (2000)).

A “reporter molecule” in the context of the method of the present invention is a chemical or physical marker which allows differentiation of labelled from unlabelled DNA by physical, chemical or immunological methods. The labelling method includes, but is not limited to radioactive labelling (e.g. with ^{33}P , ^{32}P),
20 fluorescent/luminescent/chromophor labelling and hapten labelling (i.e. psoralen or DIG). It is followed by an appropriate detection step necessary to determine the presence and/or quantity of the reporter molecule, namely scintillation counting (e.g. phosphoimaging); photooptic measurement (e.g. fluorescence measurement, luminescence measurement) and antibody-based detection (including colorimetric,
25 luminescence or fluorescence detection), respectively. Preferably, the reporter molecule is a fluorochrome/fluorophor (both terms are used as synonyms in the context of present invention) which includes but is not limited to cyanines, fluoresceins and rhodamines. More preferably, it is of the cyanine group of fluorophores. Most preferably, it is selected from the group consisting of the
30 fluorophores Cy3, Cy5 or Alexa Fluor 647 and Alexa Fluor 546. The ratio of base to dye molecules (BDR) in DNA labelled with such reporter molecules is preferably less or equal to 60.

A "target species" is a species for which species-specific capture probes are present in the microarray, allowing species identification by positive hybridisation. "Non-target species" are all other species.

Detailed description of the invention

5 The present invention provides an analytical device, preferably a DNA microarray, and its use for rapid identification and characterisation of microorganisms in a sample or clinical specimen (embodiments (1) to (3)). The invention is exemplified in the following by the most preferred embodiment of the analytical device (1), namely a DNA microarray. The invention can, however, also be performed using
10 any other of the analytical devices as listed above. Thus, unless otherwise stated, in the following the term "DNA microarray of embodiment (1)" is to be understood as "analytical device of embodiment (1)".

The DNA microarray of embodiment (1) of the invention comprises gene specific DNA sequences as capture probes, which allow the identification of microbial
15 species ("target species"), especially of bacterial and fungal species, and/or their further characterisation with regard to antibiotic resistance and virulence. Preferably, it allows the identification and characterisation of the target species. It is specific, applicable to the analysis of DNA isolated from blood cultures and suitable to detect resistance genes.

20 The DNA microarray of embodiment (1) comprises at least 1 species specific probe per target species. In a preferred aspect of the invention, it additionally comprises one or more virulence and/or resistance gene probe(s).

A further preferred aspect of embodiment (1) is that the DNA microarray comprises species specific probes for more than one or multiple microbial species,
25 i.e. for a plurality of species. The DNA microarray of this preferred aspect of embodiment (1) allows the simultaneous detection of a plurality of microbial species in a sample without previous isolation and/or amplification of single species. It furthermore allows a one-step determination of whether certain microorganisms are present in a sample or not, even if the sample comprises a plurality of different
30 microbial strains.

One important feature of the microarray of the present invention is that the panel of probes can be continually extended to include sequences for additional species,

variant isolates or antibiotic resistance determinants as they are characterised and available. The accuracy, range and discriminatory power of the gene-segment based microarray can be refined by adding or removing gene probes to the panel without significantly increasing complexity or costs. In a pilot study, three
5 important species causing bacteremia were selected to provide a proof of principle (examples 1.1-1.10). The range of organisms that can be identified can be easily expanded by increasing the number of gene probes on the array. For example, addition of a few probes specific for *S. epidermidis* and other CoNS will allow for the species identification of coagulase-negative staphylococci. Furthermore, due to a
10 specific hybridisation pattern for each species it will also allow the identification of mixed blood cultures with more than one pathogen.

A second important feature of this microarray format is the length of the DNA sequences used as gene probes. They are at least 100 nt, preferably 100-3000 nt long. In an especially preferred aspect of embodiment (1) the length of the gene
15 probes is from 100 to 1000 nt, most preferably from 200 to 800 nt. Thus, one probe per gene is usually sufficient to produce strong signals and high specificity (Stears, R.L. et al., Nat. Med., 9:140-5 (2003)). For long probes like these, minor point mutations are likely to only slightly reduce duplex formation, which does not lead to the loss of hybridisation signals. In contrast, short oligonucleotide
20 microarrays sometimes lack specificity and require multiple short oligonucleotides per one gene.

The microorganisms or microbial DNA to be detected using the microarray of present invention are preferably bacteria (such as *Staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *P. aeruginosa*, *Klebsiella* spp., *Proteus* spp., *Enterobacter* spp.,
25 *Acinetobacter* spp. and *Stenotrophomonas* spp.) or fungi (such as yeasts and filamentous fungi, in particular *Candida* spp., *Aspergillus* spp., *Cryptococcus* spp., *Malassezia* spp., *Trichosporin* spp.), respectively bacterial or fungal DNA. The microarray is especially suitable for direct identification and characterisation of bacteria and *C. albicans*.

30 In a preferred aspect of embodiment (1) the analytical device is suitable for species specific identification of one microbial strain or (preferably) a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi. It furthermore allows differentiation of the target species from each other

and from non-target-species contained in one sample comprising a plurality of microbial strains.

In one preferred aspect of embodiments (1), (2) and (3), the DNA microarray is feasible to identify and characterize any of the microorganisms, including the fungi and bacteria as defined above, known as etiological agents of fungemia, bacteremia or sepsis. In another preferred aspect of (1), it is feasible to characterize the bacteria known as etiological agents of bacteremia or sepsis. More preferably, it is feasible to identify and characterize at least 90 % of said microorganisms or bacteria. Equally more preferably it is feasible to identify and characterize microorganisms selected from the group consisting of *S. aureus*, *Coagulase-negative staphylococci*, *Enterococci*, *Streptococci*, *E. coli*, *Klebsiella* spp., *Proteus* spp, *P. aeruginosa*, *Acinetobacter* spp. and *Candida albicans*, most preferably microorganisms selected from the group consisting of *S. aureus*, CoNS (including *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*, *Staphylococcus hominis*), *C. albicans*, *Enterococcus faecalis*, *Enterococcus faecium*, *E. coli*, *Klebsiella oxytoca*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*, *P. aeruginosa*, *Acinetobacter baumannii*, *Streptococcus agalactiae*, *Streptococcus bovis*, *Streptococcus mutans*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*.

In a first most preferred aspect of embodiment (1), the DNA microarray is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococci*, *E. coli* and *Candida* sp., preferably for species specific identification of *Staphylococci*, especially of *S. aureus*. More preferably, it is suitable for species specific identification of *Staphylococci* and at least one of *E. coli* and *Candida albicans*.

In a second most preferred aspect of embodiment (1), the DNA microarray is suitable to identify and characterize at least *S. aureus*, *Coagulase-negative staphylococci*, *E. coli*, *Enterococcus faecalis* and *faecium* and *Candida albicans*.

In addition to above aspects, the DNA microarray is in a preferred embodiment of present invention suitable for additional species specific identification or differentiation of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus*

pneumoniae, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and/or *Proteus vulgaris*.

The practicability and specificity of the DNA microarray for the identification and characterisation of *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* was evaluated with clinical isolates and positive blood cultures (Examples 1.1-1.10). Especially preferred is a microarray which allows identification and characterisation of *S. aureus*. The latter microarray allows the detection of every *S. aureus* isolate, unambiguously identifies most of important virulence genes such as *tsst-1*, *sea*, *seb*, *eta* and antibiotic resistance genes such as *mecA*, *aacA-aphD*, *blaZ*, *ermA* and specifically distinguishes *S. aureus* from unrelated gram negative bacteria, e.g. *Escherichia coli* or *Pseudomonas aeruginosa*, as well as from closely related CoNS (Example 1.11, Fig. 2-6).

In another preferred aspect of the invention, the microarray of (1) is suitable for diagnosis of fungemia, bacteremia or sepsis; especially for diagnosis of bacteremia, candidemia, and bacterial or *Candida* sepsis.

The present invention provides a novel approach for detection of microorganisms, especially of bacteria and fungi, by microarrays: using gene-segments it allows species identification by probing a large and diverse set of species-specific genes. Such an approach is reliable since it makes possible to identify a pathogen even when some genes have been deleted from its genome. Furthermore, the selected DNA probes are at least 100 nt, preferably 200 to 800 nt long and are therefore not sensitive to single nucleotide polymorphisms or CG-content variations in the targets. Therefore, a gene segment array according to present invention is useful for indicating the presence of a gene even though the sequence may be slightly altered e.g. by point mutations (Southern, E. et al., Nat. Genet. 21:5-9 (1999)). Additionally, it permits species virulence and antibiotics resistance profiling all together in a single-step test. Thus, present invention provides for a significant improvement compared to the classical approach focused on the detection of a short evolutionary conserved sequence like 16S RNA.

The number and perfect composition of gene-segments necessary for a correct species identification, virulence determination and resistance profiling must be determined by empiric specificity tests. Thus, in a preferred aspect of the invention, the DNA microarray of embodiment (1) comprises the minimal number of species

- specific gene probes which is sufficient for species identification, the minimal number of virulence gene probes which is sufficient for virulence determination, and/or the minimal number of resistance gene probes which is sufficient for determination of resistance of a specific microorganism. Preferably, the minimal number of gene probes in this aspect of the invention is: for correct species identification at least 1 species specific gene probes per target species, more preferably at least 2 different species specific gene probes per target species, even more preferably at least 10, most preferably at least 20; for virulence determination at least 1 gene probe per target species, more preferably at least 5 different gene probes, even more preferably at least 20 different gene probes, most preferably gene probes for all known virulence factors of each target species; for determination of resistance at least 1 gene probe per antibiotic class or resistance factor, more preferably at least 5 different gene probes, most preferably all known gene-coded resistance determinants in the target species.
- Generally, the DNA microarray of embodiment (1) comprises gene probes which are specific for a microbial species, bacterial/fungal species or a group of microorganisms to be identified. Said gene probes are preferably DNA sequences selected from three different groups, namely (a) species specific gene probes; (b) virulence gene probes; and/or (c) resistance gene probes.
- Preferably, the species specific set of gene probes for each species to be identified and characterised is selected from species specific gene probes (a) for
- (i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *stpC*, *fnbA*, *femA*, *fmhB*, *fmhA*;
 - (ii) *Escherichia coli* including gene probes derived from *b1169*, *fliCb*, *nfrB*, *yachI*, *ycdS*, *yciQ*, *shuA*;
 - (iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*, *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;
 - (iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;

- (v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*, *agrC2Stalugd*, *slamStalugd*;
- (vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;
- 5 (vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;
- (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;
- (ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*,
 10 *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*, *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;
- (x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*,
 15 *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebsA*, *ebsB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCb2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*, *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;
- (xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*,
 20 *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;
- (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yojH*, *liac*;
- 25 (xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;
- (xiv) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;
- 30 (xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*, *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*,

- cps23fGStrpneu*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneu*, *hexB1*, *hftsHStrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*,
5 *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneu*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneu*, *wci4Strpneu*, *wciK4Strpneu*, *wciL4Strpneu*, *wciN6bStrpneu*, *wciO6bStrpneu*, *wciP6bStrpneu*, *wciY18Strpneu*, *wzdbStrpneu*,
10 *wze6bStrpneu*, *wzy18Strpneu*, *wzy4Strpneu*, *wzy6bStrpneu*, *xpt*;
(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStrgal*, *cpsJStrgal*, *cpsKStrgal*, *cpsMStrgal*, *cpsYStrgal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*,
15 *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*, *0504Straga*, *foldStraga*, *neuA1Strgal*, *neuB1Strgal*, *neuC1Strgal*, *neuD1Strgal*, *recNStraga*, *ileSStraga*;
(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog*, *fah_rph_hlo_Strpyog*, *int*, *int315.5*, *oppD*, *SPy0382Strpyog*, *SPy0390Strpyog*,
20 *SpyM3_1351*, *vicXStrpyog*;
(xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut*, *580SSstprmut*, *581_582SSstprmut*, *584SSstprmut*, *dltAStprmut*, *dltBStprmut*, *dltCpplx1Stprmut*, *dltDStprmut*, *lichStrbov*, *lytRStprmut*, *lytSSstprmut*, *pepQStprmut*, *pflCStprmut*, *recNStprmut*, *ytqBStprmut*;
25 (xix) *Proteus mirabilis* including gene probes derived from *atfA*, *atfB*, *atfC*, *ccmPrmi1*, *cyaPrmi*, *flfB*, *flfD*, *flfN*, *flhD*, *floA*, *ftsK*, *gstB*, *hemCPrmi*, *hemDPrmi*, *hev*, *katA*, *lpp1*, *menE*, *mfd*, *nrpA*, *nrpB*, *nrpG*, *nrpS*, *nrpT*, *nrpU*, *pat*, *pmfA*, *pmfC*, *pmfE*, *ppaA*, *rsbA*, *rsbC*, *speB*, *stmA*, *stmB*, *terA*, *terD*, *umoA*, *umoB*, *umoC*, *ureR*, *xerC*, *ygbA*;
30 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu*, *frdC*, *frdD*, *lad*, *tna2*;
(xxi) *Acinetobacter baumannii* including gene probes derived from *carO*, *gacS*, *dhbA*, *dhbB*, *sid*, *csuD*, *csuC*, *tnp-ACIBA*, *waaA-ACIBA*, *csuB*, *csuA_B*, *csuA*, *put1*, *por*, *abc*, *furACIBA*, *dec*, *cysI*, *trpE*, *put3*, *ompA-ACIBA*.

Preferably, the virulence specific set of gene probes for each species to be identified and characterised is selected from virulence gene probes (b) for

- (i) *Staphylococcus aureus* including gene probes derived from *bsaE*, *bsaG*, *cap5h*, *cap5i*, *cap5j*, *cap5k*, *cap8H*, *cap8I*, *cap8J*, *cap8K*, *I-hld*, *I-hysA*, *I-IgGbg*, *EDIN*, *eta*,
5 *etb*, *hglA*, *hglB*, *hglC*, *hla*, *hlyA*, *hlyB*, *lukF*, *lukS*, *NAG*, *sak*, *sea*, *seb*, *sec1*, *seg*, *seh*, *sel*, *set15*, *set6*, *set7*, *set8*, *sprV8*, *tst*, *I-sdrC*, *I-sdrD*, *I-sdrE*;
- (ii) *Escherichia coli* including gene probes derived from *b1202*, *eae*, *eltB*, *escR*, *escT*, *escU*, *espB*, *fes*, *fteA*, *hlyA*, *hlyB*, *iucA*, *iucB*, *iucC*, *papG*, *rfaE*, *shuA*, *SLTII*, *toxA-LTPA*, *VT2vaB*;
- 10 (iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD*, *hld_orf5*, *icaC*, *icaD*, *icaR*, *psm_beta1and2*, *purR*, *spoVG*, *yabJ*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt*;
- (v) *Staphylococcus lugdunensis* including gene probes derived from *fbIStalugd*, *slushABCStalugd*;
- 15 (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1*, *CDC28*, *CLN2*, *CPH1*, *CYB1*, *EFG1*, *MNT1*, *RBF1*, *RBF1*, *RIM101*, *RIM8*, *SEC14*, *SEC4*, *TUP1*, *YPT1*, *ZNF1CZF1*;
- (viii) *Enterococcus faecalis* including gene probes derived from *asa1*, *asp1*, *cgh*,
20 *cylA*, *cylB*, *cylI*, *cylL_cylS*, *cylM*, *ace*, *ef00108*, *ef00109*, *ef00111*, *ef00113*, *ef0012*, *ef0022*, *ef0031*, *ef0032*, *ef0040*, *ef0058*, *enlA*, *esa*, *esp*, *gelE*, *groEL*, *groES*, *rt1*, *sala*, *salb*, *sea1*, *sep1*, *vick*, *yycH*, *yycI*, *yycJ*;
- (ix) *Enterococcus faecium* including gene probes derived from *entA_entI*, *entD*, *entR*, *oep*, *sagA*;
- 25 (x) *Klebsiella pneumonia* including gene probes derived from *cim*, *aldA*, *hemly*, *pSL017*, *pSL020*, *rcaA*, *rmlC*, *rmlD*, *waaG*, *wbbD*, *wbbM*, *wbbN*, *wbdA*, *wbdC*, *wztKpn*, *yibD*;
- (xi) *P. aeruginosa* including gene probes derived from *aprA*, *aprE*, *ctx*, *algB*, *algN*, *algR*, *ExoS*, *fpvA*, *lasRa*, *lipA*, *lipH*, *Orf159*, *Orf252*, *pchG*, *PhzA*, *PhzB*, *PLC*, *plcN*,
30 *plcR*, *pvdD*, *pvdF*, *pyocinS1*, *pyocinS1im*, *pyocinS2*, *pys2*, *rbf303*, *rhlA*, *rhlB*, *rhlR*, *TnAP41*, *toxA*;
- (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu*, *lytA*, *nanA*, *nanBStrpneu*, *pcpCStrpneu*, *ply*, *prtAStrpneu*, *pspA*, *SP0834Strpneu*, *sphtraStrpneu*, *wciJStrpneu*, *wziyStrpneu*, *wzxStrpneu*;

(xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor*, *0499Straga*, *hylStragal*, *lipStragal*;

(xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStropyog*, *fba2Stropyog*, *fhuAStropyog*, *fhuB1Stropyog*, *fhuDStropyog*, *fhuGStropyog*, *hlyA*, *hlyP*,
 5 *hlyp2*, *oppB*, *ropB*, *scpAStropyog*, *sloStropyog*, *smez- Stropyog*, *sof*, *speA*,
speB2Stropyog, *speCStropyog*, *speJStropyog*, *srtBStropyog*, *srtCStropyog*, *srtEStropyog*,
srtFStropyog, *srtGStropyog*, *srtIStropyog*, *srtKStropyog*, *srtRStropyog*, *srtTStropyog*,
vickKStropyog;

(xv) *Streptococcus mutans* including gene probes derived from *hlyXStrmut*,
 10 *perMStrmut*;

(xvi) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*,
hpmB, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*,
patA, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*.

Preferably, the resistance specific set of gene probes is selected from resistance
 15 gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *blaIMP-7*,
mecISepid, *blaOXA-10*, *blaB*, *ampC*, *I-blaR*, *blaOXA-32*, *bla-CTX-M-22*,
pbp2aStrpneu, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *I-mecR*, *blaOXY*,
dacCStropyog, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*,
 20 *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *I-mecI*, *pbp1a*, *I-blaI*, *blaTEM-106*,
blaOXY-KLOX, *ftsWEF*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *mecR1Sepid*, *blaZ*,
blaOXA-1, *fox-6*, *blaPrmi*;

(ii) aminoglycosides resistance including gene probes derived from
aacA_aphDStwar, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*,
 25 *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*; *aacA4ENCL*, *aac(6p)-Ib7*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes
 derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *satA*, *msrA*, *mphBM*,
mefA, *mrx*;

(iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;

(v) chloramphenicol resistance including gene probes derived from *cat*,
 30 *catEfaecium*, *cmlA5*;

(vi) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*;

(vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;

(viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *albA*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;

(ix) fungicides resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

Most preferably, the resistance specific set of gene probes is selected from resistance gene probes (c) derived from genes coding for

(i) beta-lactams resistance including gene probes derived from *bla-CTX-M-22*, *blaSHV-1*, *blaTEM-106*, *mecA*, *blaZ*;

(ii) aminoglycosides resistance including gene probes derived from *aacC1*, *aacC2*, *aadA*, *aadB*, *aadD*, *aacA4*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *aphA3*;

(iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermA*, *ermB*, *ermC*;

(iv) tetracyclines resistance including gene probes derived from *tetAJ*, *tetL*, *tetM*

(vii) glycopeptides resistance including gene probes derived from *vanA*, *vanB*, *vanC-2*.

The most relevant resistance gene probes are probes derived from and specific for *mecA*. This is due to the fact that *mecA* is common to all Staphylococci including *S. aureus* and CoNS.

Since the same resistance phenotype is determined by many different genotypes, it is preferred to use a plurality of resistance gene probes for unambiguous and comprehensive prediction of antibiotic resistance. The largest available set of resistance probes is most preferred.

For the virulence assessment of a certain strain and the sub-species strain discrimination, it is preferred to use a plurality of virulence gene probes for unambiguous and comprehensive virulence determination. The use of the highest available number of genotypic markers is most favourable.

Furthermore, the microarray may contain a set of gene probes which serve as controls. Preferably, such a set of control gene probes is selected from group (d) consisting of control gene probes coding for

- 5 (i) negative controls, namely DNA sequences which will not hybridise with human DNA or bacterial, fungal or the microbial target DNA under the hybridisation conditions of the method of present invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from plant genes, more preferably from *Arabidopsis thaliana* or *Glycine max* genes;
- 10 (ii) positive controls including segments of ribosomal DNA from bacterial target species, preferably 16S DNA, and segments of conserved human genes;
- (iii) positive controls specific for DNA added to the sample ("spiked DNA"), namely DNA sequences which will not hybridise with human DNA or the fungal, bacterial or microbial target DNA under the hybridisation conditions of the method of present
15 invention, including gene probes derived neither from fungal, bacterial or target microbial nor from human genes, preferably gene probes derived from mouse or amoeba genes, most preferably from *Mus musculus* or *Dictyostelium discoideum* genes.

These control gene probes are necessary to

- 20 a) detect non-specific hybridisation;
- b) optimise hybridisation conditions and image acquisition and analysis;
- c) provide positive controls for the quality of probe preparation, hybridisation and detection; and/or
- d) control technical aspects of the entire detection procedure including
25 labelling, hybridisation and detection steps.

In a preferred aspect of embodiment (1), the microarray contains DNA sequences selected from the group consisting of the SEQ ID NOs: 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof as gene probes.

- 30 More preferably, in order to identify a specific microbial species, bacterial species or group of bacteria, the gene probes of group (a) are selected from SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-

2863, 2902 and 2903 (compare Tab. 1). Equally, in order to determine virulence of a specific micororganism or bacterial species, the gene probes of group (b) are selected from SEQ ID NO: 100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784 (compare Tab. 1). Equally, in order to determine antibiotic resistance of a specific microbial or bacterial species, the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908 (compare Tab. 1). Equally, in order to provide the required controls (negative, positive, hybridisation controls), the gene probes of group (d) are selected from SEQ ID NO:919-947, preferably from SEQ ID NO:919-925 and 944-947, more preferably from SEQ ID NO: 919 and 921 (compare Tab. 1).

Tab. 1: Preferred gene probes for species identification, virulence determination and resistance determination of microorganisms

15 **a) probes for species identification**

SEQ ID NO	Probe
1	cataSaur_1_1
2	cataSaur_1_2
3	clfA_1_1
4	clfB_1_1
5	coa_1_1
6	coa_1_2
7	I-clpC_1_1
8	I-clpP_1_1
9	I-ctaA_1_1
10	I-ctsR_1_1
11	I-dltA_1_1
12	I-dltB_1_1
13	I-dltC_1_1
14	I-dnaK_1_1
15	I-elkT_1_1
16	I-femD_1_1
17	I-glnA_1_1
18	I-glnR_1_1
19	I-grlA_1_1
20	I-grlB_1_1
21	I-groEL_1_1
22	I-groES_1_1
23	I-hemA_1_1
24	I-hemE_1_1
25	I-hemH_1_1
26	I-hemL_1_1
27	I-hemY_1_1
28	I-lepA_1_1

SEQ ID NO	Probe
29	I-lrgA_1_1
30	I-lrgB_1_1
31	I-lytM_1_1
32	I-menB_1_1
33	I-menD_1_1
34	I-menE_1_1
35	I-menF_1_1
36	I-mreB_1_1
37	I-mreR_1_1
38	I-mutL_1_1
39	I-mutS_1_1
40	I-NAG_1_1
41	I-pbg_1_1
42	I-pbpF_1_1
43	I-pdhB_1_1
44	I-pdhC_1_1
45	I-rsbU_1_1
46	I-rsbV_1_1
47	I-rsbW_1_1
48	I-sgp_1_1
49	I-sirR_1_1
50	I-sodA_1_1
51	I-sodB_1_1
52	I-sstA_1_1
53	I-sstB_1_1
54	I-sstC_1_1
55	I-sstD_1_1
56	I-trx_1_1
57	I-yhiN_1_1
58	epiP-bsaP_1_1
59	geh_1_1
60	gyrA_1_1
61	gyrB_1_1
62	hemB_1_1
63	hemC_1_1
64	hemD_1_1
65	hemN_1_1
66	hsdS_1_1
67	hsdS_2_1
68	lip_1_1
69	menC_1_1
70	murC_1_1
71	nuc_1_1
72	pdhD_1_1
73	rpoB_1_1
74	SAV0431_1_1
75	SAV0439_1_1
76	SAV0440_1_1
77	SAV0441_1_1
78	sigB_1_1
79	spa_1_2
80	sstC_1_1
81	tag_1_1

SEQ ID NO	Probe
82	tyrA_1_1
83	I-aroC_1_1
84	I-aroA_1_1
85	I-cna_1_1
86	I-ebpS_1_1
87	I-eno_1_1
88	I-fbpA_1_1
89	I-fib_1_1
90	I-fnbB_1_1
91	I-srtA_1_1
92	I-stpC_1_1
93	I-fnbA_1_1
94	I-spa_1_1
95	I-aroE_1_1
96	I-aroF_1_1
97	I-aroG_1_1
98	I-asp23_1_1
99	I-atl_1_1
142	b1169_1_1
143	envZ_1_1
144	fliCb_1_1
145	nfrB_1_1
146	nlpA_1_1
147	pilAe_1_1
148	yacH_1_1
149	yagX_1_1
150	ycdS_1_1
151	yciQ_1_1
152	ymcA_1_1
174	ardeSE0106_1_1
175	ardeSE0107_1_1
176	aroI SE0105_1_1
177	atIE_1_1
178	agrB_1_1
179	agrC_1_1
180	alphSE1368_1_1
181	gad_1_1
182	glucSE1191_1_1
183	hsp10_1_1
184	icaA_1_1
185	icaB_1_1
186	mvaSSepid_1_1
187	nitreSE1972_1_1
188	nitreSE1974_1_1
189	nitreSE1975_1_1
190	oiamtSE1209_1_1
191	ORF1Sepid_1_1
192	ORF3bSepid_1_1
193	qacR_1_1
194	sin_1_1
195	ureSE1861_1_1
196	ureSE1863_1_1
197	ureSE1864_1_1

SEQ ID NO	Probe
198	ureSE1865_1_1
199	ureSE1867_1_1
209	folQShaemolyt_1_1
210	mvaCShaemolyticus_1_1
211	mvaDShaemolyt_1_1
212	mvaK1Shaemolyticus_1_1
213	mvaSShaemolyticus_1_1
214	RNApolsigm_1_1
216	agrB2Stalugd_1_1
217	agrC2Stalugd_1_1
218	agrCStalugd_1_1
219	slamStalugd_1_1
222	RNApolsigmSsapro_1_1
223	RNApolsigmSsapro_1_2
224	msrw1Stwar_1_1
225	nukMStwar_1_1
226	proDStwar_1_1
227	proMStwar_1_1
228	sigrpoStwar_1_1
229	tnpStwar_1_1
231	ARG56_1_1
232	ASL43f_1_1
233	BGL2_1_1
234	CACHS3_1_1
235	CCT8_1_1
236	CDC37_1_1
237	CEF3_1_1
238	CHS1_1_1
239	CHS2_1_1
240	CHS4_1_1
241	CHS5_1_1
242	CHT1_1_1
243	CHT2_1_1
244	CHT4_1_1
245	CSA1_1_1
246	5triphosphatase_1_1
247	AAF1_1_1
248	ADH1_1_1
249	ALS1_1_1
250	ALS7_1_1
251	EDT1_1_1
252	ELF_1_1
253	ESS1_1_1
254	FAL1_1_1
255	GAP1_1_1
256	GNA1_1_1
257	GSC1_1_1
258	GSL1_1_1
259	HIS1_1_1
260	HTS1_1_1
261	HWP1_2_1
262	HYR1_1_1
263	INT1a_1_1

SEQ ID NO	Probe
264	KRE15f_1_1
265	KRE6_1_1
266	KRE9_1_1
267	MIG1_1_1
268	MLS1_1_1
269	MP65_1_1
270	NDE1_1_1
271	PFK2_1_1
272	PHR1_1_1
273	PHR2_1_1
274	PHR3_1_1
275	PRA1_1_1
276	PRS1_1_1
277	RBT1_1_1
278	RBT4_1_1
279	RHO1_1_1
280	RNR1_1_1
281	RPB7_1_1
282	RPL13_1_1
283	RVS167_1_1
284	SHA3_1_1
285	SKN1_1_1
286	SRB1_1_1
287	TCA1_1_1
288	TRP1_1_1
289	YAE1_1_1
290	YRB1_1_1
291	YST1exon2_1_1
308	arcA_1_1
309	arcC_1_1
310	bkdA_1_1
311	cad_1_1
312	camE1_1_1
313	csrA_1_1
314	dacA_1_1
315	dfr_1_1
316	dhoD1a_1_1
317	ABC-eltA_1_1
318	agrBfs_1_1
319	agrCfs_1_1
320	dnaE_1_1
321	ebsA_1_1
322	ebsB_1_1
323	eep_1_1
324	efaR_1_1
325	glS24_glsB_1_1
326	gph_1_1
327	gyrAEf_1_1
328	metEf_1_1
329	mntHCb2_1_1
330	mob2_1_1
331	mvaD_1_1
332	mvaE_1_1

SEQ ID NO	Probe
333	parC_1_1
334	pcfG_1_1
335	phoZ_1_1
336	polC_1_1
337	ptb_1_1
338	recS1_1_1
339	rpoN_1_1
340	tms_1_1
341	tyrDC_1_1
342	tyrS_1_1
377	bglB_1_1
378	bglR_1_1
379	bglS_1_1
380	efmA_1_1
381	efmB_1_1
382	efmC_1_1
383	mreC_1_1
384	mreD_1_1
385	mvaDEfaecium_1_1
386	mvaEEfaecium_1_1
387	mvaK1Efaecium_1_1
388	mvaK2Efaecium_1_1
389	mvaSEfaecium_1_1
390	orf3_4Efaeciumb_1_1
391	orf6_7Efaecium_1_1
392	orf7_8Efaecium_1_1
393	orf9_10Efaecium_1_1
399	atsA_1_1
400	atsB_1_1
401	budC_1_1
402	citA_1_1
403	citW_1_1
404	citX_1_1
405	dalD_1_1
406	dalK_1_1
407	dalT_1_1
408	acoA_1_1
409	acoB_1_1
410	acoC_1_1
411	ahIK_1_1
412	fimK_1_1
413	glfKPN2_1_1
414	ltrA_1_1
415	mdcC_1_1
416	mdcF_1_1
417	mdcH_1_1
418	mrkA_1_1
419	mtrK_1_1
420	nifF_1_1
421	nifK_1_1
422	nifN_1_1
423	tyrP_1_1
424	ureA_1_1

SEQ ID NO	Probe
425	wbbO_1_1
426	wza_1_1
427	wzb_1_1
428	wzmKPN2_1_1
429	wztKPN2_1_1
430	yojH_1_1
431	liac_1_1
449	cymA_1_1
450	cymD_1_1
451	cymE_1_1
452	cymH_1_1
453	cymI_1_1
454	cymJ_1_1
455	ddrA_1_1
456	fdt-1_1_1
457	fdt-2_1_1
458	fdt-3_1_1
459	gatY_1_1
460	hydH_1_1
461	masA_1_1
462	nasA_1_1
463	nasE_1_1
464	nasF_1_1
465	pehX_1_1
466	pelX_1_1
467	tagH_1_1
468	tagK_1_1
469	tagT_1_1
470	glpR_1_1
471	lasRb_1_1
472	OrfX_1_1
473	pa0260_1_1
474	pa0572_1_1
475	pa0625_1_1
476	pa0636_1_1
477	pa1046_1_1
478	pa1069_1_1
479	pa1846_1_1
480	pa3866_1_1
481	pa4082_1_1
482	pilAp_1_1
483	PilAp2_1_1
484	pilC_1_1
485	PstP_1_1
486	purK_1_1
487	uvrDII_1_1
488	vsmI_1_1
489	vsmR_1_2
490	xcpX_1_1
523	cap1EStrpneu_1_1
524	cap1FStrpneu_1_1
525	cap1GStrpneu_1_1
526	cap3AStrpneu_1_1

SEQ ID NO	Probe
527	cap3BStrpneu_1_1
528	celAStrpneu_1_1
529	celBStrpneu_1_1
530	cglAStrpneu_1_1
531	cglBStrpneu_1_1
532	cglCStrpneu_1_1
533	cglDStrpneu_1_1
534	cinA_1_1
535	cps14EStrpneum_1_1
536	cps14FStrpneum_1_1
537	cps14GStrpneum_1_1
538	cps14HStrpneum_1_1
539	cps19aHStrpneum_1_1
540	cps19aIStrpneum_1_1
541	cps19aKStrpneum_1_1
542	cps19fGStrpneum_1_1
543	cps23fGStrpneum_1_1
544	dexB_1_1
545	dinF_1_1
546	1760Strpneu_1_1
547	acyPStrpneu_1_1
548	endAStrpneu_1_1
549	exoAStrpneu_1_1
550	exp72_1_1
551	fnlAStrpneu_1_1
552	fnlBStrpneu_1_1
553	fnlCStrpneu_1_1
554	gct18Strpneum_1_1
555	hexB1_1_1
556	hftsHstrpneu_1_1
557	immunofrag1Strpneu_1_1
558	immunofrag2Strpneu_2_1
559	immunofrag3Strpneu_2_1
560	kdtBStrpneu_1_1
561	lysAStrpneu_1_1
562	pcpBStrpneu_1_1
563	pflCStrpneu_1_1
564	plpA_1_1
565	prtA1Strpneu_1_1
566	pspC1Strpneu_1_1
567	pspC2_1_1
568	purRStrpneu_1_1
569	pyrDAstrpneum_1_1
570	SP0828Strpneu_1_1
571	SP0830Strpneu_1_1
572	SP0833Strpneu_1_1
573	SP0837_38Strpneu_1_1
574	SP0839Strpneu_1_1
575	ugdStrpneu_1_1
576	uncC_1_1
577	vicXStrepneu_1_1
578	wchA6bStrpneum_1_1
579	wci4Strpneum_1_1

SEQ ID NO	Probe
580	wciK4Strpneum_1_1
581	wciL4Strpneum_1_1
582	wciN6bStrpneum_1_1
583	wciO6bStrpneum_1_1
584	wciP6bStrpneum_1_1
585	wciY18Strpneum_1_1
586	wzdbStrpneum_1_1
587	wze6bStrpneum_1_1
588	wzy18Strpneum_1_1
589	wzy4Strpneum_1_1
590	wzy6bStrpneum_1_1
591	xpt_1_1
606	cpsA1Strgal_1_1
607	cpsB1Strgal_1_1
608	cpsC1Strgal_1_1
609	cpsD1Strgal_1_1
610	cpsE1Strgal_1_1
611	cpsG1Strgal_1_1
612	cpsIStrgal_1_1
613	cpsJStrgal_1_1
614	cpsKStrgal_1_1
615	cpsMStrgal_1_1
616	cpsYStrgal_1_1
617	cpsYStrgal_2_1
618	cylBStraga_1_1
619	cylEStraga_1_1
620	cylFStraga_1_1
621	cylHStraga_1_1
622	cylIStraga_1_1
623	cylJStraga_1_1
624	cylKStraga_1_1
625	0487Straga_1_1
626	0488Straga_1_1
627	0493Straga_1_1
628	0495Straga_1_1
629	0498Straga_1_1
630	0500Straga_1_1
631	0502Straga_1_1
632	0504Straga_1_1
633	folDStraga_1_1
634	neuA1Strgal_1_1
635	neuB1Strgal_1_1
636	neuC1Strgal_1_1
637	neuD1Strgal_1_1
638	recNStraga_1_1
639	ileSStraga_1_1
645	cyclStrpyog_1_1
646	fah_rph_hlo_Strpyog_1_1
647	int_1_1
648	int315.5_1_1
649	murEStrpyog_1_1
650	oppA_1_1
651	oppCStrpyog_1_1

SEQ ID NO	Probe
652	oppD_1_1
653	SPy0382Strpyog_1_1
654	SPy0390Strpyog_1_1
655	SpyM3_1351_1_1
656	vicXStrpyog_1_1
687	573Stprmut_1_1
688	580SStprmut_1_1
689	581_582SStprmut_1_1
690	584SStprmut_1_1
691	dltAStrmut_1_1
692	dltBStrmut_1_1
693	dltCpx1Strmut_1_1
694	dltDStrmut_1_1
695	lichStrbov_1_1
696	lytRStprmut_1_1
697	lytSStprmut_1_1
698	pepQStrrmut_1_1
699	pflCStrmut_1_1
700	recNStprmut_1_1
701	ytqBStrmut_1_1
706	atfA_1_1
707	atfB_1_1
708	atfC_1_1
709	ccmPrmi1_1_1
710	cyaPrmi_1_1
711	aad_1_1
712	flfB_1_1
713	flfD_1_1
714	flfN_1_1
715	flhD_1_1
716	floA_1_1
717	ftsK_1_1
718	gstB_1_1
719	hemCPrmi_1_1
720	hemDPrmi_1_1
721	hev_1_1
722	katA_1_1
723	lpp1_1_1
724	menE_1_1
725	mfd_1_1
726	nrpA_1_1
727	nrpB_1_1
728	nrpG_1_1
729	nrpS_1_1
730	nrpT_1_1
731	nrpU_1_1
732	pat_1_1
733	pmfA_1_1
734	pmfC_1_1
735	pmfE_1_1
736	ppaA_1_1
737	rsbA_1_1
738	rsbC_1_1

SEQ ID NO	Probe
739	speB_1_1
740	stmA_1_1
741	stmB_1_1
742	terA_1_1
743	terD_1_1
744	umoA_1_1
745	umoB_1_1
746	umoC_1_1
747	ureR_1_1
748	xerC_1_1
749	ygbA_1_1
776	envZPrvu_1_1
777	frdC_1_1
778	frdD_1_1
779	infBPrvu_1_1
780	lad_1_1
781	tna2_1_1
2843	carO_1_1
2844	gacS_1_1
2845	dhbA_1_1
2846	dhbB_1_1
2847	sid_1_1
2848	csuD_1_1
2849	csuC_1_1
2850	tnp-ACIBA_1_1
2851	waaA-ACIBA_1_1
2852	csuB_1_1
2853	csuA_B_1_1
2854	csuA_1_1
2855	put1_1_1
2856	por_1_1
2857	abc_1_1
2858	furACIBA_1_1
2859	dec_1_1
2860	cysI_1_1
2861	trpE_1_1
2862	put3_1_1
2863	ompA-ACIBA_1_1
2902	coa_3_1
2903	coa_2_2
2876	asr_1_1
2877	lacZ_1_1
2878	ehuS_1_1
2879	ehuV_1_1
2880	slyA_1_1
2881	ORF165_1_1
2882	ehuU_1_1
2883	ehuT_1_1
2884	ORF295_1_1
2885	ehuA_1_1
2886	ORF400_1_1
2887	H+ATPase_1_1
2889	smeE_1_1

SEQ ID NO	Probe
2890	eE_1_1
2891	StmPr1_1_1
2892	eD_2_1
2893	ppi_1_1
2894	pmp-STEMA_1_1
2895	pam_1_1
2896	ORF4-STEMA_1_1
2897	ORF2-STEMA_1_1
2898	et_1_1
2899	eF_1_1
2900	StmPr2_1_1
2901	smeF4494_1_1
2904	fasCAXStrdysg_1_1
2906	ydhK_1_1

b) virulence probes

SEQ ID NO	Probe
100	bsaE_1_1
101	bsaG_1_1
102	cap5h_1_1
103	cap5i_1_1
104	cap5j_1_1
105	cap5k_1_1
106	cap8H_1_1
107	cap8I_1_1
108	cap8J_1_1
109	cap8K_1_1
110	I-hld_1_1
111	I-hysA_1_1
112	I-IgGbg_1_1
113	EDIN_1_1
114	eta_1_1
115	etb_1_1
116	hglA_1_1
117	hglA_2_1
118	hglB_1_1
119	hglC_2_1
120	hla_1_1
121	hlb_1_2
122	lukF_1_1
123	lukS_1_1
124	lukS_2_1
125	NAG_1_1
126	sak_1_1
127	sea_1_1
128	seb_1_1
129	sec1_1_1
130	seg_1_1
131	seh_1_1
132	sel_1_1
133	set15_1_1

SEQ ID NO	Probe
134	set6_1_1
135	set7_1_1
136	set8_1_1
137	sprV8_1_1
138	tst_1_1
139	I-sdrC_1_1
140	I-sdrD_1_1
141	I-sdrE_1_1
153	b1202_1_1
154	eae_1_1
155	eltB_1_1
156	escR_1_1
157	escT_1_1
158	escU_1_1
159	espB_1_1
160	fes_1_1
161	fes_2_1
162	fteA_1_1
163	hlyA_1_1
164	hlyB_1_1
165	iucA_1_1
166	iucB_1_1
167	iucC_1_1
168	papG_1_1
169	rfbE_1_1
170	shuA_1_1
171	SLTII_1_1
172	toxA-LTPA_1_1
173	VT2vaB_1_1
200	gcaD_1_1
201	hld_orf5_1_1
202	icaC_1_1
203	icaD_1_1
204	icaR_1_1
205	psm_beta1and2_1_1
206	purR_1_1
207	spoVG_1_1
208	yabJ_1_1
215	lipShaemolyt_1_1
220	fblStalugd_1_1
221	slushABCStalugd_1_1
230	gehASTwar_1_1
292	CCN1_1_1
293	CDC28_1_1
294	CLN2_1_1
295	CPH1_1_1
296	CYB1_1_1
297	EFG1_1_1
298	MNT1_1_1
299	RBF1_1_1
300	RBF1_2_1
301	RIM101_1_1
302	RIM8_1_1

SEQ ID NO	Probe
303	SEC14_1_1
304	SEC4_1_1
305	TUP1_1_1
306	YPT1_1_1
307	ZNF1CZF1_2_1
343	asa1_1_1
344	asp1_1_1
345	cgh_1_1
346	cylA_1_1
347	cylB_1_1
348	cylI_1_1
349	cylL_cylS_1_1
350	cylM_1_1
351	ace_1_1
352	ef00108_1_1
353	ef00109_1_1
354	ef0011_1_1
355	ef00113_1_1
356	ef0012_1_1
357	ef0022_1_1
358	ef0031_1_1
359	ef0032_1_1
360	ef0040_1_1
361	ef0058_1_1
362	enlA_1_1
363	esa_1_1
364	esp_1_1
365	geIE_1_1
366	groEL_1_1
367	groES_1_1
368	rt1_1_1
369	sala_1_1
370	salb_1_1
371	sea1_1_1
372	sep1_1_1
373	vick_1_1
374	yycH_1_1
375	yycI_1_1
376	yycJ_1_1
394	entA_entI_1_1
395	entD_1_1
396	entR_1_1
397	oep_1_1
398	sagA_1_2
432	cim_1_1
433	aldA_1_1
434	aldA_2_1
435	hemly_1_1
436	pSL017_1_1
437	pSL020_1_1
438	rcaA_1_1
439	rmlC_1_1
440	rmlD_1_1

SEQ ID NO	Probe
441	waaG_1_1
442	wbbD_1_1
443	wbbM_1_1
444	wbbN_1_1
445	wbdA_1_1
446	wbdC_1_1
447	wztKpn_1_1
448	yibD_1_1
491	aprA_1_1
492	aprE_1_1
493	ctx_1_2
494	algB_1_1
495	algN_1_1
496	algR_1_1
497	ExoS_1_1
498	fpvA_1_1
499	lasRa_1_1
500	lipA_1_1
501	lipH_1_1
502	Orf159_1_2
503	Orf252_1_1
504	pchG_1_1
505	PhzA_1_1
506	PhzB_1_1
507	PLC_1_1
508	plcN_1_1
509	plcR_1_1
510	pvdD_1_1
511	pvdF_1_2
512	pyocinS1_1_1
513	pyocinS1im_1_1
514	pyocinS2_1_1
515	pys2_1_1
516	pys2_2_1
517	rbf303_1_1
518	rhIA_1_1
519	rhIB_1_1
520	rhIR_1_1
521	TnAP41_1_2
522	toxA_1_1
592	igaStrpneu_1_1
593	lytA_1_1
594	nanA_1_1
595	nanBStrpneu_1_1
596	pcpCStrpneu_1_1
597	ply_1_1
598	prtAStrpneu_1_1
599	pspA_1_2
600	SP0834Strpneu_1_1
601	SP0834Strpneu_1_2
602	sphtraStrpneu_1_1
603	wciJStrpneu_1_1
604	wziyStrpneu_1_1

SEQ ID NO	Probe
605	wzxStrpneu_1_1
640	CAMPfactor_1_1
641	CAMPfactor_2_1
642	0499Straga_1_1
643	hylStragal_1_1
644	lipStragal_1_1
657	DNaseIStrpyog_1_1
658	fba2Strpyog_1_1
659	fhuAStrpyog_1_1
660	fhuB1Strpyog_1_1
661	fhuDStrpyog_1_1
662	fhuGStrpyog_1_1
663	hyla_1_1
664	hylP_1_1
665	hylp2_1_1
666	oppB_1_1
667	ropB_1_1
668	scpAStrpyog_1_1
669	sloStrpyog_1_1
670	smez-4Strpyog_1_1
671	sof_1_1
672	sof_2_1
673	speA_1_1
674	speB2Strpyog_1_1
675	speCStrpyog_1_1
676	speJStrpyog_1_1
677	srtBStrpyog_1_1
678	srtCStrpyog_1_1
679	srtEStrpyog_1_1
680	srtFStrpyog_1_1
681	srtGStrpyog_1_1
682	srtIStrpyog_1_1
683	srtKStrpyog_1_1
684	srtRStrpyog_1_1
685	srtTStrpyog_1_1
686	vickKStrpyog_1_1
702	hlyXStrmut_1_1
703	igaStrmitis_1_1
704	igaStrsanguis_1_1
705	perMStrmut_1_1
750	flaA_1_1
751	flaD_1_1
752	fliA_1_1
753	hpmA_1_1
754	hpmB_1_1
755	lpsPrmi_1_1
756	mrpA_1_1
757	mrpB_1_1
758	mrpC_1_1
759	mrpD_1_1
760	mrpE_1_1
761	mrpF_1_1
762	mrpG_1_1

SEQ ID NO	Probe
763	mrpH_1_1
764	mrpI_1_1
765	mrpJ_1_1
766	patA_1_1
767	putA_1_1
768	uca_1_1
769	ureDPrmi_1_1
770	ureEPrmi_1_1
771	ureFPrmi_1_1
772	zapA_1_1
773	zapB_1_1
774	zapD_1_1
775	zapE_1_1
782	end_1_1
783	pqrA_1_1
784	urg_1_1
2905	sloStrep_1_1

c) resistance probes

SEQ ID NO	Probe
785	blaIMP-7_1_1
786	mecISepid_1_1
787	blaOXA-10_1_2
788	blaB_1_1
789	ampC_1_1
790	I-blaR_1_1
791	blaOXA-32_1_1
792	bla-CTX-M-22_1_1
793	pbp2aStrpneu_1_1
794	blaSHV-1_1_1
795	blaOXA-2_1_1
796	blaRShaemolyt_1_1
797	blaIMP-7_1_2
798	I-mecR_1_1
799	blaOXY_1_1
800	dacCStrpyog_1_1
801	femA_1_1
802	mecA_1_1
803	blaIShaemolyt_1_1
804	blavim_1_1
805	pbp2b_1_1
806	pbp2primeSepid_1_1
807	pbp2x_1_1
808	pbp3Saureuc_1_1
809	pbp4_1_1
810	pbp5Efaecium_1_1
811	pbpC_1_1
812	I-mecI_1_1
813	pbp1a_1_1
814	I-blaI_1_1
815	blaTEM-106_1_1

SEQ ID NO	Probe
816	blaOXY-KLOX_1_1
817	ftsWEF_1_1
818	fmhB_1_1
819	cumA_1_1
820	femBShaemolyt_1_1
821	blaPER-1_1_1
822	bla_FOX-3_1_1
823	blaA_1_1
824	psrb_1_1
825	fmhA_1_1
826	mecR1Sepid_1_1
827	blaZ_1_1
828	blaOXA-1_1_1
829	fox-6_1_1
830	blaPrmi_1_1
831	aacA_aphDStwar_1_1
832	aacC1_1_2
833	aacC2_1_1
834	strB_1_1
835	aadA_1_1
836	aadB_1_2
837	aadD_1_1
838	aacA4_1_2
839	strA_1_1
840	aph-A3_1_1
841	aacC1_1_1
842	aacA4_1_1
843	aacA-aphD_1_1
844	I-spc_1_1
845	aphA3_1_1
846	ermC_1_1
847	linB_1_1
848	satSA_1_1
849	mdrSA_1_1
850	I-linA_1_1
851	ermB_1_2
852	ermA_1_1
853	satA_1_1
854	msrA_1_1
855	mphBM_1_1
856	mefA_1_1
857	mrX_1_1
858	dfrStrpneu_1_1
859	dfrA_1_1
860	cmlA5_1_1
861	catEfaecium_1_1
862	cat_1_1
863	tetAJ_1_1
864	tetL_1_1
865	tetM_1_1
866	vanH(tn)_1_1
867	vanA_1_1
868	vanHB2_1_1

SEQ ID NO	Probe
869	vanR_1_1
870	vanRB2_1_1
871	vanS(tn)_1_1
872	vanSB2_1_1
873	vanWB2_1_1
874	ddl_1_1
875	ble_1_1
876	vanXB2_1_1
877	vanY(tn)_1_1
878	vanYB2_1_1
879	vanB_1_1
880	vanZ(tn)_1_1
881	vanC-2_1_1
882	vanX(tn)_1_1
883	acrB_1_1
884	mexB_1_2
885	I-qacA_1_1
886	sulI_1_1
887	sul_1_1
888	cadBStalugd_1_1
889	mexA_1_1
890	acrR_1_1
891	emeA_1_1
892	acrA_1_1
893	rtn_1_1
894	abcXStrpmut_1_1
895	qacEdelta1_1_1
896	elkT-abcA_1_1
897	I-cadA_1_1
898	albA_1_1
899	wzm_1_1
900	msrCb_1_1
901	nov_1_1
902	wzt_1_1
903	wbbI_1_1
904	norA23_1_1
905	mexR_1_1
906	arr2_1_1
907	mreA_1_1
908	I-cadC_1_1
909	uvrA_1_1
910	CRD2_1_1
911	CDR1_1_1
912	CDR1_2_1
913	MET3_1_1
914	FET3_1_1
915	FTR2_1_1
916	MDR1-7_1_1
917	ERG11_1_1
918	SEC20_1_1
2864	aacA4ENCL_1_1
2865	AdeR-ACIBA_1_1
2866	adeA-ACIBA_1_1

SEQ ID NO	Probe
2867	aac(6p)-lb7_1_1
2868	adeB-ACIBA_1_1
2869	adeC-ACIBA_1_1
2870	AdeS-ACIBA_1_1
2871	blaL2_1_1
2872	blaMIR-3_1_1
2873	ampR_1_1
2874	ampC-ENCL_1_1
2875	blaL1_1_1
2888	sulII_1_1
2907	tetA-ACIBA_1_1
2908	tetR-ACIBA_1_1

d) controls and utility

SEQ ID NO	Probe
919	rbcl_1_1
925	rbcl_1_2
920	LDHA(hu)_1_1
921	GAPD(hu)_1_1
922	b-Act(hu)_1_1
923	ARHGDIA(hu)_1_1
924	PGK1(hu)_1_1
926	16SPa_1_1
927	23SEfaecium_2_1
928	16SStrepyog_1_1
929	16SStreneu_1_1
930	16SSrepagalactiae_1_1
931	16SEfaecium_1_1
932	16SEfaecium_2_1
933	16SRNAEf_2_1
934	16SKpn_1_1
935	16SSa_3_1
936	16SRNAEf_1_1
937	16SShominis_1_1
938	16SShaemolyt_1_1
939	23SEfaecium_1_1
940	16SrRNAPrmi_1_1
941	16SrRNAPrvu1_1_1
942	16SSa_1_1
943	16SKlox_1_1
944	p53_1_1
945	0135mihck_1_1
946	FAN_1_1
947	0270cap_1_1
2842	16SStrepdysgal_1_1

The DNA microarray of (1) is preferably suitable for

- 5 (I) identification of *Staphylococcus aureus* and comprises one or more or all gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71,

74, 76, 77, 79, 2902 and 2903, preferably at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) identification of *Escherichia coli* and comprises one or more or all gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probes represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) identification of *Staphylococcus haemolyticus* and comprises one or more or all gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) identification of *Staphylococcus lugdunensis* and comprises one or more or all gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) identification of *Staphylococcus warneri* and comprises one or more or all gene probes selected from SEQ ID NO:224-228 and 230 preferably at least one of the gene probes represented by SEQ ID NO:224, 226 and 230; and/or

(VII) identification of *Staphylococcus saprophyticus* and comprises one or more or all gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) identification of *Staphylococcus hominis* and comprises one or more or all gene probes selected from SEQ ID NO:2096, 194 and 229 (do hybridise with *S. hominis* DNA) and 211 and 214 (do not hybridise with *S. hominis* DNA); and/or

(IX) identification of *Candida albicans* and comprises one or more or all gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) identification of *Enterococcus faecalis* and comprises one or more or all gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

(XI) identification of *Enterococcus faecium* and comprises one or more or all gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) identification of *Klebsiella pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

5 (XIII) identification of *Klebsiella oxytoca* and comprises one or more or all gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

(XIV) identification of *Pseudomonas aeruginosa* and comprises one or more or all gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at
10 least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) identification of *Streptococcus pneumoniae* and comprises one or more or all gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

15 (XVI) identification of *Streptococcus agalactiae* and comprises one or more or all gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO: 606 and 619; and/or

(XVII) identification of *Streptococcus pyogenes* and comprises one or more or all gene probes selected from SEQ ID NO:645-648, 652, 655, 656, 658 and 660,
20 preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) identification of *Streptococcus mutans* and comprises one or more or all gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

25 (XIX) identification of *Proteus mirabilis* and comprises one or more or all gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

(XX) identification of *Proteus vulgaris* and comprises one or more or all gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene
30 probes represented by SEQ ID NO:776, 777 and 781; and/or

(XXI) identification of *Acinetobacter baumannii* and comprises one or more or all gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

In a preferred aspect of present invention, the DNA microarray of embodiment (1) is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

In a second preferred aspect, the DNA microarray is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively. These microorganisms are the prevalent microorganisms in clinical samples and/or are of the highest diagnostic relevance. The probes listed under (a) to (h) are the most reliable probes for identification of said microorganisms.

From above second preferred aspect, there can be selected a set of probes which is even more preferred, namely SEQ ID NO:71, 2906, 145 and 249. A DNA microarray comprising one, several or all of said four probes is suitable for species specific detection or differentiation of

- (i) *S. aureus* if it comprises SEQ ID NO:71;
- (ii) CoNS if it comprises SEQ ID NO:2906;
- (iii) *E. coli* if it comprises SEQ ID NO:145; and/or
- (iv) *Candida albicans* if it comprises SEQ ID NO:249.

5 This set of four probes thus forms an especially preferred set of probes for embodiment (1).

There are some further sets of probes which are especially preferred for the DNA microarray of embodiment (1). Namely, there are a few DNA microarrays which form preferred aspects of embodiment (1). They are suitable for species-specific
 10 identification and differentiation of the following sets of microorganisms and therefore comprise at least the minimum number of probes which are necessary for the species specific identification:

- (A) *S. aureus*;
- (B) Staphylococci including *S. aureus* and CoNS;
- 15 (C) set (A) or (B) additionally including *E. coli*;
- (D) any of the sets of (A) to (C) additionally including *C. albicans*;
- (E) any of the sets of (A) to (D) additionally including *Enterococcus* sp.;
- (F) any of the sets of (A) to (E) additionally including *Proteus* sp. and/or *P. aeruginosa*.
- 20 Sets (B), (C) and (D) are preferred, set (D) is especially preferred.

In addition, the DNA microarray of embodiment (1) may be suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

- 25 In a further especially preferred aspect, the DNA microarray of (1) is suitable for
 - (I) virulence determination of *Staphylococcus aureus* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141; and/or
 - (II) virulence determination of *Escherichia coli* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173; and/or

- (III) virulence determination of *Staphylococcus epidermidis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208; and/or
- (IV) virulence determination of *Staphylococcus haemolyticus* and comprises the
5 gene probe of group (b) represented by SEQ ID NO:215; and/or
- (V) virulence determination of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:220-221; and/or
- (VI) virulence determination of *Staphylococcus warneri* and comprises the gene
10 probe of group (b) represented by SEQ ID NO:230; and/or
- (VII) virulence determination of *Candida albicans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:292-307; and/or
- (VIII) virulence determination of *Enterococcus faecalis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:343-376; and/or
- 15 (IX) virulence determination of *Enterococcus faecium* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:394-398; and/or
- (X) virulence determination of *Klebsiella pneumonia* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:432-448; and/or
- (XI) virulence determination of *Klebsiella oxytoca*; and/or
- 20 (XII) virulence determination of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:491-522; and/or
- (XIII) virulence determination of *Streptococcus pneumoniae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:592-605;
25 and/or
- (XIV) virulence determination of *Streptococcus agalactiae* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:640-644; and/or
- (XV) virulence determination of *Streptococcus pyogenes* and comprises one or
30 more or all of the gene probes of group (b) selected from SEQ ID NO:657-686; and/or
- (XVI) virulence determination of *Streptococcus mutans* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:702-705; and/or

(XVII) virulence determination of *Proteus mirabilis* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:750-775; and/or

(XVIII) virulence determination of *Proteus vulgaris* and comprises one or more or all of the gene probes of group (b) selected from SEQ ID NO:782-784.

5 In a further especially preferred aspect, the DNA microarray of (1) is suitable for antibiotic resistance determination of (I) *Staphylococcus aureus*, (II) *Escherichia coli*, (III) *Staphylococcus epidermidis*, (IV) *Staphylococcus haemolyticus*, (V) *Staphylococcus lugdunensis*, (VI) *Staphylococcus warneri*, (VIII) *Enterococcus faecalis*, (IX) *Enterococcus faecium*, (X) *Klebsiella pneumonia*, (XI) *Klebsiella*
 10 *oxytoca*, (XII) *Pseudomonas aeruginosa*, (XIII) *Streptococcus pneumoniae*, (XIV) *Streptococcus agalactiae*, (XV) *Streptococcus pyogenes*, (XVI) *Streptococcus viridans*, (XVII) *Proteus mirabilis*, and/or (XVIII) *Proteus vulgaris* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909; 2864-2875, 2888, 2907-2908 and/or

15 it is suitable for antibiotic resistance determination of (VII) *Candida albicans* and comprises one or more or all of the gene probes of group (c) selected from SEQ ID NO:910-918.

In a preferred embodiment, the microarray of (1) is suitable for identification and characterisation, i.e. virulence and/or resistance determination, of the target
 20 microorganism and comprises one or more or all of the gene probes of group (a) and additionally one or more or all of the gene probes of group (b) and group (c) for each organism as listed above.

If the identification and/or characterisation of *S. aureus*, *E. coli* and/or *P. aeruginosa* is the aim of a test using the array, then the array comprises preferably
 25 at least the core gene probes designated in example 1.7, more preferably all the sequences listed in Tab. 2 and/or Tab. 6. Even more preferred, it consists of said sequences.

The gene probes were considered as most preferable if they were i) known previously to be species-specific, ii) bioinformatically selected to have the least
 30 chance to hybridise with nontarget genes and iii) empirically proven to be specific in a series of experiments (see Examples).

In a most especially preferred aspect, the DNA microarray of (1) comprises the following gene probes, even more preferably consists of the following gene probes:

(I) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus aureus*, it comprises

(a) the gene probes represented by SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903; and at least one of

5 (b) the gene probes represented by SEQ ID NO:100-141 and

(c) the gene probes represented by SEQ ID NO:785-909, 2864-2875, 2888, 2907, 2908.

(II) When the DNA microarray is suitable for identification and characterisation of *Escherichia coli*, it comprises

10 (a) the gene probes represented by SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170; and at least one of

(b) the gene probes represented by SEQ ID NO:153-173 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

15 (III) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus epidermidis*, it comprises

(a) the gene probes represented by SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199; and at least one of

(b) the gene probes represented by SEQ ID NO: 200-208 and

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875, 2888, 2907, 2908.

(IV) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus haemolyticus*, it comprises

25 (a) the gene probes represented by SEQ ID NO:211, 213 and 214; and at least one of

(b) the gene probes represented by SEQ ID NO: 215 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

30 (V) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus lugdunensis*, it comprises

(a) the gene probes represented by SEQ ID NO:216, 217 and 219-221; and at least one of

(b) the gene probes represented by SEQ ID NO: 220-221 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(VI) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus warneri*, it comprises

5 (a) the gene probes represented by SEQ ID NO:224-228 and 230; and at least one of

(b) the gene probes represented by SEQ ID NO: 230 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

10 (VII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus saprophyticus*, it comprises

(a) the gene probes represented by SEQ ID NO:222 and 223; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (VIII) When the DNA microarray is suitable for identification and characterisation of *Staphylococcus hominis*, it comprises

(a) the gene probes represented by SEQ ID NO:2096, 194, 229, 211 and 214; and at least one of

20 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(IX) When the DNA microarray is suitable for identification and characterisation of *Candida albicans*, it comprises

(a) the gene probes represented by SEQ ID NO:231-291; and at least one of

(b) the gene probes represented by SEQ ID NO: 292-307 and

25 (c) the gene probes represented by SEQ ID NO: 910-918, 2864-2875 2888, 2907, 2908.

(X) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecalis*, it comprises

30 (a) the gene probes represented by SEQ ID NO:308-310 and 312-342; and at least one of

(b) the gene probes represented by SEQ ID NO: 343-376 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XI) When the DNA microarray is suitable for identification and characterisation of *Enterococcus faecium*, it comprises

(a) the gene probes represented by SEQ ID NO:377-393; and at least one of

(b) the gene probes represented by SEQ ID NO: 394-398 and

5 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella pneumonia*, it comprises

10 (a) the gene probes represented by SEQ ID NO:399, 401-404, 408-415, 417, 420-423, 425 and 427-431; and at least one of

(b) the gene probes represented by SEQ ID NO: 432-448 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

15 (XIII) When the DNA microarray is suitable for identification and characterisation of *Klebsiella oxytoca*, it comprises

(a) the gene probes represented by SEQ ID NO:459 and 466-469; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

20 (XIV) When the DNA microarray is suitable for identification and characterisation of *Pseudomonas aeruginosa*, it comprises

(a) the gene probes represented by SEQ ID NO:470-485, 487-493 and 505; and at least one of

(b) the gene probes represented by SEQ ID NO: 491-522 and

25 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XV) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pneumoniae*, it comprises

(a) the gene probes represented by SEQ ID NO:523-591; and at least one of

30 (b) the gene probes represented by SEQ ID NO: 592-605 and

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVI) When the DNA microarray is suitable for identification and characterisation of *Streptococcus agalactiae*, it comprises

- (a) the gene probes represented by SEQ ID NO:606-639; and at least one of
- (b) the gene probes represented by SEQ ID NO: 640-644 and
- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

5 (XVII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus pyogenes*, it comprises

- (a) the gene probes represented by SEQ ID NO:645-648, 652, 655-656, 658 and 660; and at least one of
- (b) the gene probes represented by SEQ ID NO: 657-686 and

10 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XVIII) When the DNA microarray is suitable for identification and characterisation of *Streptococcus mutans*, it comprises

- (a) the gene probes represented by SEQ ID NO:687-701; and at least one of

15 (b) the gene probes represented by SEQ ID NO: 702-705 and

- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XIX) When the DNA microarray is suitable for identification and characterisation of *Proteus mirabilis*, it comprises

20 (a) the gene probes represented by SEQ ID NO:706-710, 712-742 and 744-749; and at least one of

- (b) the gene probes represented by SEQ ID NO: 750-775 and

- (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

25 (XX) When the DNA microarray is suitable for identification and characterisation of *Proteus vulgaris*, it comprises

- (a) the gene probes represented by SEQ ID NO:776-778 and 780-781; and at least one of

- (b) the gene probes represented by SEQ ID NO: 782-784 and

30 (c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

(XXI) When the DNA microarray is suitable for identification and characterisation of *Acinetobacter baumannii*, it comprises

- (a) the gene probes represented by SEQ ID NO:2843-2863; and at least one of

(c) the gene probes represented by SEQ ID NO: 785-909, 2864-2875 2888, 2907, 2908.

The DNA microarray which is a preferred aspect of embodiment (1) can be fabricated using textbook methods for microarray production, including printing with fine-pointed pins onto the solid support, photolithography using pre-made masks or dynamic micromirror devices, ink-jet printing or electrochemistry on microelectrode arrays (Müller, H.-J., Röder, T., "Der Experimentator: Microarrays, Spektrum Akademischer Verlag, Heidelberg (2004)). Preferred fabrication methods are printing methods spotting the gene probes onto the solid surface of the microarray. The attachment of the spotted DNA to the surface is achieved by covalent or non-covalent binding, preferably by non-covalent binding, more preferably by electrostatic interaction (ionic binding), most preferably by ionic binding of the DNA to amino groups present on the surface of the solid support. Any amino-functionalized microarray support can be used, but gamma aminopropyl silane (GAPS™) coated slides, especially UltraGAPS™ coated glass slides, are preferred in present invention.

The amount of DNA per spot printed onto the array is from 0.1 to 15.0 ng, preferably from 0.1 to 0.2 ng.

Thus, the present invention also pertains to a method for fabrication of a microarray of embodiment (1), which method comprises spotting the gene probes listed above to an appropriate solid support.

The sample of embodiments (1) to (4) may be any sample containing microorganisms, including food samples, environmental samples and clinical specimens. A sample which is a clinical specimen is preferred. The sample or clinical specimen of embodiments (1) to (4) is preferably selected from the group consisting of whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, swabs, wound fluid and positive blood cultures, more preferably is whole blood or a positive blood culture, most preferably is a positive blood culture. If blood culture is used as DNA source, 0.5 ml positive blood culture is sufficient for identification and characterisation of the microorganisms and bacteria present without prior amplification of the target DNA.

Thus, the microarray of present application is

(i) a robust diagnostic tool, detecting all tested bacterial reference strains and clinical isolates;

(ii) sensitive enough to yield positive signals with e.g. only 20 ng of purified genomic *S. aureus* DNA or 2 µg of DNA extracted from blood culture which contains a high percentage of human DNA;

(iii) highly specific, distinguishing e.g. *S. aureus* from distantly related gram-negative bacteria like *Escherichia coli* or *Pseudomonas aeruginosa* as well as from closely related CoNS;

(iv) precise enough to identify virulence factors and antibiotic resistance determinant genes without previous amplification by PCR.

Moreover, the whole procedure can be accomplished the same day after blood cultures become positive (e.g. in the Bactec®). Rapid identification of the causative pathogen in fungemia, bacteremia and sepsis is crucial for several reasons:

(i) appropriate antimicrobial therapy should be started as early as possible and unnecessary treatment avoided;

(ii) the prognosis of the patients with sepsis may be improved; and

(iii) expenditures on antimicrobials and prolonged hospitalisation can be reduced.

The DNA microarray of embodiment (1) is especially suitable for diagnosis of

(i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus*, *E. coli*, CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*; and/or

(iii) urinary tract infections, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

With the gene-segment based microarray of (1) there is an excellent correlation between genotypic detection of antibiotic resistance determinants and phenotypic typing using conventional susceptibility testing. In one aspect of the invention, the detection of the resistance genes *mecA*, *blaZ*, *ermA*, *ermC*, *msrSA*, *aadD* and *aacA-aphD* by microarray hybridisation allows for reliable prediction of oxacillin, penicillin, erythromycin, tobramycin and gentamicin resistance in a single assay.

By microarray hybridisation according to present invention it is furthermore possible to discriminate multi-resistant and multi-susceptible MRSA (strain MW2). Multi-susceptible MRSA have been shown to be susceptible to tobramycin and erythromycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001);
5 Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

In a preferred aspect of the invention, simultaneous comprehensive resistance genotyping for oxacillin, macrolide and aminoglycoside resistance genes (preferably *mecA*, *aadD*, *aacA-aphD*, *ermA,B,C* and *msrSA*) by microarray hybridisation allows the rapid discrimination of multi-resistant or multi-susceptible strains and in
10 consequence other therapeutic options with e.g. macrolides and may reduce reliance on vancomycin (Polyzou, A. et al., J. Antimicrob. Chemother. 48:231-4 (2001); Pournaras, S. et al., J. Clin. Microbiol. 39:779-81 (2001)).

One preferred aspect of embodiment (1) is a DNA microarray for the identification and characterisation of the three important bacteremia causing species
15 *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* in a sample, preferably in blood culture. The microarray allows simultaneous species identification and detection of important virulence and antibiotic resistance genes in a single assay. Preferably, this array consists of 2-20 species specific gene probes, 1-20 virulence gene probes and 1-20 resistance gene probes of at least 100 nt
20 length, more preferably of 200-800 nt length. One especially preferred embodiment is an array comprising or consisting of the gene probes listed in Tab. 2. The probes may be amplified from recombinant plasmids or synthesized by any other method known in the art. These probes represent genes encoding house-keeping proteins, virulence factors and antibiotic resistance determinants. Evaluation with 42 clinical
25 isolates, 3 reference strains and 13 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus*, *E. coli* and *P. aeruginosa* strains and in discriminating them from closely related Gram-positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia. In Example 1.6 and 1.7, this array was successful in identifying all tested 27 *E. coli*, *P.*
30 *aeruginosa* and *S. aureus* strains and in discriminating them from 21 closely related Gram positive and Gram negative bacterial strains. There is a nearly perfect correlation between genotypic antibiotic resistance by hybridisation to the *S. aureus* resistance gene probes *mecA* (oxacillin/methicillin resistance), *aacA-aphD*

(gentamicin resistance), *ermA* (erythromycin resistance) and *blaZ* (penicillin resistance) and the *E. coli* resistance gene probes *blaTEM-106* (penicillin resistance) and *aacC2* (aminoglycoside resistance) and phenotypic antibiotic resistance determined by conventional susceptibility testing (Example 1.10).

- 5 One further preferred aspect of embodiment (1) of the invention is a DNA microarray for the identification and characterisation of *S. aureus* in a sample, preferably in blood culture. Evaluation with 10 clinical isolates, 6 reference strains and 10 positive blood cultures revealed that this DNA microarray is highly specific in identifying *S. aureus* and in discriminating them from closely related Gram-
10 positive and Gram-negative bacterial strains also known to be etiological agents of bacteremia (Example 1.11).

The DNA microarray is - in the context of embodiment (2) - preferably used for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain(s)
15 contained in a mixture of a plurality of microorganisms. The DNA microarray of embodiment (1) is advantageous for this kind of use, as it allows the simultaneous determination of the presence or absence in the analysed sample of all those microbial strains for which the device comprises species specific probes. The array is also suitable for identification and determination of single or of a selection of
20 microbial strains in a mixture of strains, especially in a clinical sample containing additional component, without prior isolation of the target strain. These advantages (simultaneous determination and applicability to clinical samples and mixtures) make the DNA microarray of embodiment (1) superior to conventional techniques of DNA amplification for identification of microbial strains like PCR.

- 25 The method of embodiment (3) comprises - after isolating the total DNA (including non-microbial DNA) from a sample - the steps of immediate labelling and microarray-based detection of this isolated DNA with or without, preferably without, further DNA amplification steps after the DNA isolation. It is one advantage of the method (3) that it can be performed without said further DNA amplification steps,
30 i.e. the isolated DNA is labelled and applied to the microarray without prior amplification. The use of a single protocol for all microbial species comprising all steps of a microarray procedure including DNA preparation and DNA-chip hybridisation, is essential for testing blood cultures or other clinical specimens,

where the bacterial diagnosis is usually uncertain. Preferably, a DNA preparation protocol employing sonication for simultaneous cell disruption and target DNA fragmentation is the method of choice to increase the sensitivity of the microarray, in particular towards low-copy number and/or plasmid encoded genes which may be underrepresented in the target DNA.

The method of embodiment (3) is preferably a method for diagnosis of bacteremia, fungemia or sepsis. Furthermore, the sample or clinical specimen used in embodiment (3) is preferably blood or derived from blood, more preferably is a blood culture. Most preferably, the clinical specimen is a positive blood culture.

To obtain positive signals in the method of embodiment (3), 100 pg of purified genomic microbial DNA may be sufficient (lower detection limit), but preferably at least 1 ng of said DNA should be present in the sample. Usually, at least 10 ng, preferably at least 20 ng, more preferably at least 1 µg of purified genomic microbial DNA or at least 1 µg, preferably at least 2 µg of DNA extracted from blood culture are required. 500 µl of positive blood culture yield enough DNA for several hybridisations.

In a preferred aspect of the method of embodiment (3), the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming. In a further preferred aspect, the DNA isolated in step (a) is fragmented before the labelling reaction. Both aspects simplify and speed up the analysis in comparison to convention methods.

In the method of embodiment (3), the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than or equal to 100 %, preferably is from 1% to 99%, more preferably from 30 to 60%.

The labelling reaction of the method of embodiment (3) may be any DNA labelling reaction known in the art. However, chemical labelling reactions consisting of chemical attachment of a reporter molecule to the sample DNA and labelling by integration of labelled nucleotides into the sample DNA are preferred. Preferably the reporter molecules are fluorophores, more preferably are of the cyanine group of fluorophores. Most preferably, the DNA is labelled with Cy3, Cy5 and/or Alexa Fluor 647 and Alexa Fluor 546. The ratio of bases to dye molecules (BDR) is preferably less or equal to 60.

The detection of the reporter molecule in the method of embodiment (3) of the invention is preferably done by using a suitable detection system for the bound reporter molecule. This detection system is preferably based on visualization of the reporter molecule, more preferably on fluorescence detection. Furthermore, the detection is preferably done by a microarray scanner or microarray reader.

In the method of embodiment (3) of the invention, the DNA microarray can be substituted by any other solid support onto which DNA gene probes are attached in a way permitting hybridisation of the DNA in the sample and subsequent detection of the bound DNA. This includes the use of microtiter plates coated with one or several DNA gene probes per well, of glass surfaces (like, e.g., microscopic slides) with DNA spots, of filter paper disks, membranes, gold electrodes and beads (particles with a diameter of from 1 nm to several μm made of glass, plastic, metal etc.) coated with DNA, etc.. The beads are preferably used in a multi-chamber system, more preferably in a microfluidic multi-chamber system, wherein each chamber contains a population of beads. Each bead has an attached DNA sequence and the whole beads population in one chamber will carry the same DNA sequence, each chamber corresponding then to a specific capture probe. The target DNA to be analysed flows through the multi-chamber system and will hybridize with the complementary DNA sequences attached to the beads. Beads could be also attached to a surface by magnetic force, i.e. paramagnetic beads coupled with DNA could be attached on the surface of the magnet and arrange in a lattice structure. Complimentary, beads made of a magnetic material could be attached to an iron surface.

The use of the DNA coated beads or of a DNA microarray of embodiment (1) is preferred. The use of a DNA array is especially preferred.

Thus, in one preferred aspect, in the method of embodiment (3) the analytical device is a DNA microarray. In this case, the detection is preferably performed using a DNA microarray reader. In a second preferred aspect, the analytical device is a DNA coated bead or a set of DNA coated beads (plurality of DNA coated beads). In this case, the application and/or detection step is preferably performed in a microfluidic device.

The kit of embodiment (4) of the invention may additionally comprise reagents for the labelling reactions of embodiment (3) and/or reagents necessary for the hybridisation step of the method of embodiment (3).

5 The present invention is described in more detail by reference to the following examples. It should be understood that these examples are for illustrative purpose only and are not to be construed as limiting the invention.

Examples

10 In the experimental examples described below, standard techniques of recombinant DNA technology were used that were described in various publications, e.g. Sambrook et al. (1989), Molecular Cloning: A Laboratory Manual, Cold Spring Harbor Laboratory, or Ausubel et al. (1987), Current Protocols in Molecular Biology 1987-1988, Wiley Interscience. Unless otherwise indicated, all enzymes and kits were used according to the manufacturers' specifications.

Example 1.1: Materials and Methods

15 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA, Herndon, Virginia). Clinical isolates were obtained
20 from the inventors' clinical routine microbiology laboratory.

The following bacteria were used for evaluation of the specificity of the microarray in Examples 1.2-1.10: *Staphylococcus aureus* (ATCC 25923, NRS123 alias MW2, 5 clinical isolates), *Staphylococcus epidermidis* (5 clinical isolates), *Staphylococcus capitis* (clinical isolate), *Staphylococcus haemolyticus* (clinical isolate),
25 *Staphylococcus hominis* (clinical isolate), *Staphylococcus warneri* (clinical isolate), *Staphylococcus auricularis* (clinical isolate), *Micrococcus* spp. (clinical isolate), *Escherichia coli* (ATCC 25922, 6 clinical isolates), *Pseudomonas aeruginosa* (ATCC27853, 5 clinical isolates), *Klebsiella pneumoniae* (3 clinical isolates), *Proteus mirabilis* (2 clinical isolates), *Serratia marcescens* (2 clinical isolates), *Enterobacter cloacae* (clinical isolate), *Enterobacter aerogenes* (clinical isolate), *Acinetobacter baumannii* (clinical isolate), *Stenotrophomonas maltophilia* (clinical isolate),
30 *Enterococcus* spp. (clinical isolate), *Enterococcus faecalis* (clinical isolate) and

Streptococcus pneumoniae (clinical isolate). Bacterial strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth (TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Blood cultures: Aerobic and anaerobic blood culture bottles (BACTEC®, Becton Dickinson, Heidelberg, Germany) were inoculated with blood from patients with suspected sepsis and placed in a BACTEC® 9240 blood culture system (Becton Dickinson), a continuous-reading, automated, and computed blood culture system that detects the growth of microorganisms by monitoring CO₂ production. Incubation was performed according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and aliquots of 1 ml of the blood culture suspensions were taken aseptically with a needle syringe. 1 ml-aliquots of the blood culture suspensions were mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt human blood cells. Bacterial cells were then harvested at 17,900 g for 10 min, pellets were washed in 1 ml TE, recovered by centrifugation and used for DNA preparation. For conventional identification and susceptibility testing, a second 1 ml-aliquot was examined by Gram-stain and subcultured on agar plates. The organisms grown on agar plates were characterised and tested for susceptibility using a VITEK-2 system (bioMérieux, Inc., Nürtingen, Germany), Etest strips (AB BIODISK, Solna, Sweden) or disk diffusion tests following the method recommended by the National Committee for Clinical Laboratory Standards (NCCLS) (Standards, N.C.f.C.L., Approved standard M2-4a, Villanova, PA (1990)).

For microarray hybridisation experiments, DNA was prepared from 13 blood cultures positive for *S. aureus* (4), *S. epidermidis* (3), *S. pneumoniae* (2), *P. aeruginosa* (1), *E. coli* (2) and *P. mirabilis* (1).

Example 1.2: DNA preparation

Total cellular DNA was extracted and purified either by using the First-DNA All-tissue kit (GEN-IAL GmbH, Troisdorf, Germany) following the instructions of the

supplier or by enzymatic lysis followed by phenol/chloroform extraction. For the latter protocol, cell pellets were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0, 2 mM EDTA, pH 8.0, and 1.2% Triton®-X-100) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 0.8 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, cell lysates were treated with Proteinase K (1 mg/ml; Sigma) for 1 hour at 55°C and then with RNase A (0.2 mg/ml; Qiagen, Hilden, Germany) for 1 hour at 37°C. The volume was increased by the addition of 200 µl TE and the salt concentration was adjusted to 0.7 M by addition of 5 M NaCl. A 10% CTAB (cetyltrimethylammonium bromide) solution in 0.7 M NaCl was added to a final concentration of 1% and incubated at 65°C for 20 min in order to release DNA from polysaccharide DNA complexes. DNA was then extracted once with phenol/chloroform/isoamyl alcohol (25:24:1) and once with chloroform/isoamyl alcohol (24:1) prior to precipitation with one volume of isopropanol. After centrifugation at 17,900 g for 30 min, DNA pellets were washed in 70% ethanol and resuspended in 50-100 µl TE.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 1.3: DNA labelling

Total DNA from commercially available reference strains, clinical isolates and blood cultures was labelled by a non-enzymatic chemical labelling method using the Label It Cy3/Cy5 kits (Mirus, Madison, USA) or the ULYSIS Alexa Fluor 467 Nucleic Acid Labelling Kit (Molecular Probes; Eugene, USA). Prior to labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls.

For labelling with the Label It Cy3/Cy5 kit 5 µg of high molecular weight DNA (>20 kb) were mixed with 7.5 µl reagent in a total volume of 50 µl and incubated for 2 hours at 37°C according to the recommendations by the supplier. After adjusting the volume to 200 µl with H₂O and adding 0.1 volume of 5 M NaCl, unbound label was removed by precipitation with 2 volumes of ice-cold absolute ethanol for at least 30 min at -20°C. The labelled DNA was recovered by centrifugation at 17,900

g for 30 min. The pellet was washed with 70% ethanol and resuspended in 70 µl TE.

For labelling with the Ulysis Alexa Fluor 647 kit, 1 µg DNA was denatured at 95°C for 5 min, cooled on ice, mixed with 20 µl labelling buffer and 5 µl reagent and incubated at 80°C for 15 min according to the instructions of the manufacturer. Unbound dye was removed by ethanol precipitation as described above. The relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 1.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All together 120 gene segments representing virulence genes, antibiotic resistant determinants and species specific metabolic and structural genes from *S. aureus* (40), *E. coli* (31) and *P. aeruginosa* (49) were represented on the microarray (Tab. 2).

Tab. 2: Gene probes with SEQ ID NOs, function, gi numbers and primer sequences. *E. coli* gene probes (1-31), *P. aeruginosa* gene probes (32-80), *S. aureus* gene probes (81-120).

Ar-ray No.	Sym-bol	Function	gi number	gene probe SEQ ID NO	Primer forward [SEQ ID NO]	Primer reverse [SEQ ID NO]
1	<i>envZ</i>	Inner membrane osmosensor	453286	143	AGCCTGGTGACGA CTTATC [1233]	ATCCGCCAGTTGCTT AAC [1234]
2	<i>fes(2)</i>	Enterochelin esterase (siderophore)	145916	161	TGTTTCTGCACTCG AAATG [1269]	GGCAATAGCTTTCAC CAG [1270]
3	<i>fes(1)</i>	Enterochelin esterase (siderophore)	145916	160	TGTTTGAGGTCAC TTTCTGG [1267]	CAATAGCTTTCACCA GGG [1268]

4	<i>nfrB</i>	Bacteriophage N4 receptor, inner membrane protein	16127994	145	ATGGAATTGCGTCTGTTTC [1237]	AAGTTTAGCCACAGCAGG [1238]
5	<i>yachH</i>	Putative membrane protein	16127994	148	GACTCGGTACAGCGATTG [1242]	CTGACGTTGGGTATCTCG [1243]
6	<i>yagX</i>	Putative enzyme	16127994	149	CTTTACGACGGTTCTCCC [1244]	AATCTTCCCTGCTGAATAG [1245]
7	<i>ycdS</i>	Putative outer membrane protein	16127994	150	TTGAAACTTCTTAC TGCCG [1246]	AATTTCTAATGCAGCGTATTG [1247]
8	<i>b1169</i>		16127994	142	GTTTGGGACTTATTGCTCTG [1230]	CATCAGCCACAGTTTCAAG [1231]
9	<i>b1202</i>	Putative outer membrane protein	16127994	153	GAATACCAAAGCAGATCGTC [1252]	CCGAGATCGACAACAGAG [1253]
10	<i>fliCb</i>	Flagellar H antigen	8071787	144	ACCACGACAGGTC TTTATG [1234]	AGAGAGGCACCGTC ACTAC [1235]
11	<i>iucA</i>	Aerobactin synthesis (siderophore)	474189	165	CATCAGGCAGTTATCCTGTC [1276]	AGTCGTCCTCCTGCA TTAC [1277]
12	<i>iucB</i>	Aerobactin synthesis (siderophore)	474189	166	TTCACAGCGGATATGGAC [1278]	CAC TTTGCTCCCAGAAATAC [1279]
13	<i>iucC</i>	Aerobactin synthesis (siderophore)	474189	167	AGACTGGGATTTGTGTC AAC [1280]	AGACACCATCCTGCC TTC [1281]
14	<i>papG</i>	Adhesin, P-pili protein	42307	168	GGAGTATATTGCGTGGGTAG [1282]	AAGATTACCATAGAGGCG [1283]
15	<i>yciQ</i>	Putative membrane protein	16127994	151	ATAGCAGGGCTGT TTGTATC [1248]	GACACGGAAACCAATTAAC [1249]
16	<i>ymcA</i>	Hypothetical protein	16127994	152	TATTGTCATCGCGCAGAG [1250]	TGTTGGGTTGAAAGAGTAGC [1251]
17	<i>eae</i>	Genetic locus necessary for the production of attaching and effacing lesions on tissue culture, OM protein adhesin	145852	154	CTAACTCATTGTGGTGGAGC [1254]	CTTGTCATCGGTCATGTTG [1255]
18	<i>eltB</i>	Enterotoxin subunit B	145830	155	GGCGTTACTATCCTCTCTATG [1256]	TTTCCATACTGATTGCCG [1257]
19	<i>escR</i>	Secretion	2897961	156	TTTGTTGTTATTGGTACTTCATTC [1258]	ATCGAAATTGTTACTGGCG [1259]
20	<i>escT</i>	Secretion	2897961	157	TTACGCTTCCGATCATAGTAG [1260]	GAATACGTTTAGTTGAGGCG [1261]
21	<i>escU</i>	Secretion	2897961	158	AAGTGAAGAGGTATGCGCTG [1262]	TACCATCAGTATCCTTGGC [1263]

22	<i>espB</i>	Protein secreted by enteropathogenic <i>E. coli</i>	1657262	159	GATGGTGACTCTATGTCAGG [1264]	CCATACGATTCTGGACCTC [1265]
23	<i>hlyA</i>	Enterohemorrhagic <i>Escherichia coli</i> hemolysin	525328	163	CTTGGAATGTTGGTAAAGC [1272]	TAAACTCCTTCGGTTGAGC [1273]
24	<i>hlyB</i>	Enterohemorrhagic <i>Escherichia coli</i> hemolysin	1247757	164	TCAATGCTGAAACTATAAGGC [1274]	ACTTAGCACCCAGTTCGAC [1275]
25	<i>SLTII</i>	Shiga-like toxin type II	304950	171	TTCTTCGGTATCCTATTCCC [1288]	TGTGAGGTCCACTTCTTCC [1289]
26	<i>toxALTPA</i>	Subunit A of heat-labile enterotoxin	148027	172	AAATGGCGACAAATTATACC [1290]	CTGGGTCTCCTCATTACAAG [1291]
27	<i>VT2vaB</i>	Verotoxin-2 variant, beta-subunit, shiga-like toxin	148261	173	AAGAAGATGTTTATGGCGG [1292]	GATTCACAGGTA CTGGATTG [1293]
28	<i>aacC2</i>	aminoglycoside-(3)-N-acetyltransferase	45769	833	GACCGATCACCCCTACGAG [2612]	CGAAATGCTTCTCAAGATAGG [2613]
29	<i>blaTEM-106</i>	Class A beta-lactamase	21464484	815	ACATCGAACTGGATCTCAAC [2576]	TCTCAGCGATCTGCTATTTTC [2577]
30	<i>strB</i>	Streptomycin resistance protein B	17129524	834	AAGTTTCATTGCCAGACG [2614]	TAGACTGCGTTGCTCTC [2615]
31	<i>sul</i>	Dihydropteroate synthase, sulfonamide resistance	17129524	887	CATCGTCAACATACCTCG [2720]	AATTCTTGCGGTTTCTTTC [2721]
32	<i>algB</i>	Alginate biosynthesis (exopolysaccharide)	150990	494	CACTTTCCGTTATTGCCTC [1934]	GAGGATGAGGATGTGCGC [1935]
33	<i>algN</i>	Alginate biosynthesis (exopolysaccharide)	150999	495	GACTGGCTGAATCGTCTC [1936]	GCAGGTCGTACCAGGAAG [1937]
34	<i>algR</i>	Alginate biosynthesis (exopolysaccharide)	151003	496	ATTGTGCGATGACGACCTC [1938]	TTCAGGTAGAGCTGGAAATG [1939]
35	<i>aprA</i>	Alkaline protease	45279	491	CATTGAAAGGTCGTAGCG [1928]	CGACGAAGTGGATATTGG [1929]
36	<i>aprE</i>	Alkaline protease secretion	45279	492	GGTCAAGCACATCTAGTG [1930]	ACTTCCTTGCGGTACTCC [1931]

37	<i>glpR</i>	Repression of glycerol metabolic enzymes (glp=glycerol-3-phosphate)	1399486	470	CAAGCACAACAAG AAATACG [1886]	TAGACCTCCGAAGA GTTGC [1887]
38	<i>lasRa</i>	Elastase, virulence protein	309873	499	CTGGGACGTTAGT GTCATC [1944]	GTCTTGGCATTGAGT TCG [1945]
39	<i>lasRb</i>	Transcriptional activator of elastase	151325	471	GAGCGACCTTGGA TTCTC [1888]	ATAAGACCCAAATTA ACGGC [1889]
40	<i>lipA</i>	Extracellular triacylglycerol lipase	45340	500	AAGAAGTCTCTGCT CCCC [1946]	ACGATTTCTCCACC TGT [1947]
41	<i>lipH</i>	Lipophilic protein necessary for the expression of active lipase	483463	501	ATGGCAGTTTCAGT GTCG [1948]	CGAAATAGTCGTCCA GCC [1949]
42	<i>mexA</i>	Multidrug resistance protein MexA precursor	5616092	889	CTCGACCCGATCTA CGTC [2724]	GTCTTCACCTCGACA CCC [2725]
43	<i>Orf252</i>	DnaJ-like protein	4545242	503	GACCTGCTGTTCCA GTTG [1952]	AATTCACGGGTTTTTC TCG [1953]
44	<i>OrfX</i>	Regulatory protein, glycerol metabolism	1399486	472	ATGGATGCTCGGG TACTG [1890]	CTCAGCTACAGCCAC GAC [1891]
45	<i>pa0260</i>	Hypothetical protein	15595198	473	GATCGTCTCTGCCC AGTC [1892]	ACATTGATGGTGTCG TCC [1893]
46	<i>pa0572</i>	Hypothetical protein	15595198	474	AGGAGAGAACATG AGTCGC [1894]	TCCTTGTCCAGTAG TTACC [1895]
47	<i>pa1046</i>	Hypothetical protein	15595198	477	AGGCATCCATCGA GCTAC [1900]	AACGTCCGAGCAGG ATAC [1901]
48	<i>pa1069</i>	Hypothetical protein	15595198	478	GCGAGGAGGTATT CGACA [1902]	CCCTTCTGCGAGTAG TGTT [1903]
49	<i>pa1846</i>	Hypothetical protein	15595198	479	AAGGACTTCTGGTC GGTG [1904]	CAGGAACAGGTGCT CGTAG [1905]
50	<i>pa4082</i>	Hypothetical protein	15595198	481	CGAGCACCAATATC GAAC [1908]	GAGCCGTAGGTGTT ATCG [1909]
51	<i>pchG</i>	Necessary for formation of siderophore pyochelin	4325021	504	CCTGCTCAACACCT TCTATC [1954]	GTCGAACAACGCGA ACAG [1955]
52	<i>PhzA</i>	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	505	GTTGAAAGGGTTTA CCGAC [1956]	AATTTCTGCATCGGG TTC [1957]

53	<i>PLC</i>	Phospholipase C (heat labile-hemolysin)	151492	507	GACTTCGCTGTTTCG ACTTC [1960]	TCGGTTCGAGTTCAT AGC [1961]
54	<i>plcN</i>	Non-hemolytic phospholipase C	151497	508	GTGTTCCAGGTGTT CGAC [1962]	GATAGACGTTGTCCT TGACC [1963]
55	<i>plcR</i>	Phospholipase C regulation	151499	509	ACAACCTGGAACA GCAACT [1964]	CGACTCTTGCGCGTA TTC [1965]
56	<i>PstP</i>	Phosphoenolpyruvate-protein phosphotransferase	4545246	485	GAAGTGAAGTCCG CCAAG [1916]	TCGAGCATCATCAGG TAGAC [1917]
57	<i>purK</i>	AIR carboxylase II, purine biosynthesis	1621599	486	TCGAGAAGTCGAT GTTCAAG [1918]	CTTGCCGTAGTGATG CAG [1919]
58	<i>rhIA</i>	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	518	AGTCTGTTGGTATC GGTTTG [1982]	CTCCAGGTCGAGGA AATG [1983]
59	<i>rhIR</i>	Rhamnolipid regulation	1117916	520	TTCGATTACTACGC CTATGG [1986]	GGTCCATTGCAGGAT CTC [1987]
60	<i>toxA</i>	Exotoxin A precursor	15595198	522	GTGCGCTACAGCT ACACG [1990]	CTTGCCCTTCCCAGGT ATC [1991]
61	<i>uvrDII</i>	DNA helicase II UvrD	3249556	487	AGACCTACAACAAG GTTTCG [1920]	TGAGGATAGTCCCTT CGC [1921]
62	<i>vsmI</i>	Autoinducer synthesis protein	695153	488	ATTCTCTCTGAAT CGCTG [1922]	AATATCTTCATCGCC AGTTG [1923]
63	<i>xcpX</i>	Secretion protein, translocation of exoproteins across outer membrane	45433	490	TTCAACCTCAACGG ACTG [1926]	TGCAAGGTACTCACC AGC [1927]
64	<i>ExoS</i>	Exoenzyme S, secreted toxin	13892017	497	CGTTTGGGACAGA TTGAG [1940]	GATACTCTGCTGACC TCGC [1941]
65	<i>fpvA</i>	Ferripyoverdine receptor	1633044	498	AATGCGATAACCAT CAGC [1942]	CCGTCGTAAGTGGAA GTTG [1943]
66	<i>pa0625</i>	Hypothetical protein	15595198	475	AGGAGCAACTGAA GCGAC [1896]	TCTGCCTTTACCCAG GAC [1897]
67	<i>pa0636</i>	Hypothetical protein	15595198	476	AAGGTTGGCAGGA TCAAC [1898]	CTAGTGGCGAAATTG AACAG [1899]
68	<i>pa3866</i>	Hypothetical protein	15595198	480	TTCCCTAACGAATG CTGTC [1906]	CGTTGCTCCCTCATA CAC [1907]
69	<i>PhzB</i>	Phenazine biosynthesis proteins (low molecular weight toxins)	5616088	506	ATGCTCGATAATGC TATTCC [1958]	TTCTCGTAGTAACCC TCGG [1959]

70	<i>pilAp</i>	Type IV pilin, involved in twitching motility and attachment	18535593	482	GCTTTACCTTGATC GAACTG [1910]	TCAATAGAGCCAGTC ACACC [1911]
71	<i>PilAp2</i>	type IV pilin, involved in twitching motility and attachment	21629637	483	TGCCGTGAGTGAA ATCAG [1912]	CGTAGTTGGCTTTCC AGTT [1913]
72	<i>pilC</i>	Pilin biogenesis protein	18535591	484	GGTATCAACCCACT AAAGGTC [1914]	GTCCAGAGCTTCTAC CAGAG [1915]
73	<i>pvdD</i>	Pyoverdine synthetase D (siderophore)	1633044	510	GTCAAGGGTGTTG TCTGC [1966]	CTCTGCACAACTCA GGG [1967]
74	<i>pyocin S1</i>	PyocinS1, bacteriocin	286179	512	CTTCAGTTCCGAGA TGCC [1970]	GTAACGAACGCTATC GGG [1971]
75	<i>pyocin S1im</i>	Immunity protein of pyocin S1	286179	513	ATATACGGAAAAAG AGTTTCTTGAG [1972]	AGCACGCCATTCTTT AACTTC [1973]
76	<i>pyocin S2</i>	PyocinS2	286182	514	TATACGGCTTCAGA CTTTCC [1974]	TGGCATAAGTATTGG CAG [1975]
77	<i>pys2(1)</i>	PyocinS2	15595198	515	TCGCCAATAAGAAG AAATTG [1976]	AGTGGTACTCGAAG GGTTCT [1977]
78	<i>pys2(2)</i>	PyocinS2	15595198	516	ATCCAGTATATTCC TGCTCG [1978]	TGCAATTTCTTCTTAT TGGC [1979]
79	<i>rbf303</i>	B-band LPS (O-antigen) biosynthesis	836903	517	ATCGTTCTGGTCTT CCTTG [1980]	ACCAAAGAGTGTTGA TAGCC [1981]
80	<i>rhIB</i>	Rhamnosyl-transferase involved in rhamnolipid biosurfactant synthesis	452502	519	AACGCTTTCTCGAT CAGG [1984]	GATACTGTGCGGTTG TGA [1985]
81	<i>femA</i>	Factor essential for methicillin resistance	4929298	801	TACAGTCATTTAC GCAAAC [2548]	TCACGCTCTTCATT AGTTCT [2549]
82	<i>fmhA</i>	Factor essential for methicillin resistance	4574232	825	TGACTTCGGATGA GTTCAAT [2596]	GCTGTTAATTGTTGT TGCTTT [2597]
83	<i>fmhB</i>	Factor essential for methicillin resistance, putative	4574234	818	CTCACCCAAATGGA GATTTA [2582]	CTTGCTTTTCAGATG TTTCC [2583]
84	<i>gyrA</i>	DNA gyrase subunit A	296393	60	AGGCTCGTATGATT GAAAAA [1066]	GGTTTTGAGCACGAT ATGTAG [1067]
85	<i>gyrB</i>	DNA gyrase subunit B	296393	61	TTGGCACAACGAT AAGACA [1068]	AAAAATCGTTCAAAG TGCTC [1069]

86	<i>hemB</i>	Porphobilinogen synthase	2589180	62	ATCATCAGCGACAA TGAGAG [1070]	TTTTTAACATCTCGA ACTATATCTAA [1071]
87	<i>hemN</i>	Oxygen-independent coproporphyrinogen oxidase	14349226	65	TCTTCCATTCTCTC AGTCAA [1076]	AGACCATGTATGTAG GTGGC [1077]
88	<i>hla</i>	α -Hemolysin	46763	120	GTCAGCTCAGTAAC AACAAAC [1186]	GTAGCGAAGTCTGG TGAAAA [1187]
89	<i>lip</i>	Lipase	393265	68	TGCATCTTCCATTT TAATAGC [1082]	GTCATTGTCCTTTGT TGGTT [1083]
90	<i>menC</i>	o-Succinylbenzoic acid synthetase	1255258	69	TTGACAGCTTTGCA TTTTTA [1084]	GGCTTTGTTGCTTTT AATGA [1085]
91	<i>NAG</i>	N-acetylglucosaminidase	2506026	125	AAGTTGCTCAAATA CAAGCTG [1196]	TGATGTTAGCCCAAT CTACA [1197]
92	<i>norA23</i>	Quinolone resistance protein	4115706	904	GGTACTTGTTGCT GCTTTT [2754]	CGTAATCGCAATCGA AATA [2755]
93	<i>nuc</i>	Nuclease	46623	71	TGGCTATCAGTAAT GTTTCG [1088]	GAATCAGCGTTGTCT TCG [1089]
94	<i>rpoB</i>	RNA polymerase B-subunit	677848	73	TGGAAGACATCGT AAACGTA [1092]	TGGATCAAAGAAACG TGAAT [1093]
95	<i>tag</i>	DNA-3-methyladenine glycosidase	6434027	81	TTTTGATTTATCTTC TGACGG [1108]	CATTCATTTTATTCCC ACCT [1109]
96	<i>16SSa</i>	16S rRNA	46498	942	TCTCTGATGTTAGC GGCGG [2830]	TCAGGCTTCGCCCA TT [2831]
97	<i>clfB</i>	Clumping factor B	3393010	4	TAGCATAGCAACAA ACAGTGA [954]	GTTTTGACCTGAAGC TGTATC [955]
98	<i>EDIN</i>	Epidermal cell differentiation inhibitor	152997	113	AAAGATAGTTCTAA GATAAATGGTC [1172]	GGCCATTATTGGTCT GTTG [1173]
99	<i>elkT-abcA</i>	Lantibiotic epilancin K7 translocator	1841513	896	ATTAGAAATTGCGA CTGGTG [2738]	AGCGTGTCATATCCT TCATC [2739]
100	<i>epiP-bsaP</i>	Biosynthesis of lantibiotic epidermin; serine protease	21204850	58	CTTAGATGTCCCAT GCTGAT [1062]	GTCAAACGAGTGCTA ATGGT [1063]
101	<i>geh</i>	Lipase precursor; glycerol ester hydrolase	153019	59	TTCAATAGGCGTG GTGTC [1064]	TTATCTGTCGGTTTC TCTGG [1065]
102	<i>mreA</i>	ABC transporter	7548683	907	TACGATGACACCA GTCTTTG [2760]	ATCGACAAAACGTAC AGGAT [2761]
103	<i>murC</i>	UDP-N-acetylmuramoyl-L-alanine synthetase	2642658	70	GTATTATTGCTTGG GGTGAT [1086]	GGATATTTCTTTTCGT GCTGT [1087]

104	<i>sak</i>	Staphylokinase	47425	126	TGTTATTATTCTCA TTTTCTTCAAT [1198]	ATGCTCTGATAAATC TGGGA [1199]
105	<i>sea</i>	Enterotoxin A	153120	127	TTTTATTCATTGCC CTAACG [1200]	TTTTCAGAGTTAATC GTTTTATTATC [1201]
106	<i>sec1</i>	Enterotoxin C	46566	129	AATTTTTGGCACAT GATTTA [1204]	CTTTTATGTCTAGTT CTTGAGCTG [1205]
107	<i>etb</i>	Exfoliative toxine B precursor	153011	115	TTTtagcagcgtca ATTTT [1176]	CTGATCCAGAGTTTC CTACCT [1177]
108	<i>seb</i>	Enterotoxin B	152999	128	CGTAGATGTGTTTG GAGCTA [1202]	CTTGAGCAGTCACCT TTTTC [1203]
109	<i>sstC</i>	Iron transport protein	3724154	80	TGATATTGGAAGAT ATTAGCATAGA [1106]	TGACAATCGCTTTAT TCATTT [1107]
110	<i>tst</i>	Toxic shock syndrome toxin	18266750	138	TTTTATCGTAAGC CCTTTG [1222]	CAATAACCACCCGTT TTATC [1223]
111	<i>aacA- aphD</i>	Bifunctional aminoglyco- side modifying enzyme	3676412	843	AGATTTGCCAGAAC ATGAAT [2632]	TGTTGCATTTAGTCT TTCCA [2633]
112	<i>aadD</i>	Aminoglyco- side acetyl transferase	21623792	837	GCTATTGGTGTTTA TGGCTC [2620]	CTGATTGCTTAACTG CTTCA [2621]
113	<i>aph- A3</i>	3'5'-amino- glycoside acetyl- transferase	1272325	840	GAGAATATCACCG GAATTGA [2626]	GCTCGACATACTGTT CTTCC [2627]
114	<i>blaZ</i>	β -lactamase	1575124	827	TGCTTTAGTTTTAA GTGCATGT [2600]	TCCTTCATTACACTC TTGGC [2601]
115	<i>cat</i>	Chlorampheni- col acetyl- transferase	46651	862	AGAAAATTGGGATA GAAAAGAA [2670]	CTGCAAGGCAACTG GTAT [2671]
116	<i>dfrA</i>	S1 dihydro- folate reductase	3676404	859	CAATTACCTTGGA CTTACC [2664]	CCCTTTTCTACGCAC TAAAT [2665]
117	<i>ermA</i>	rRNA methylase	13785452	852	CCAGAAAAACCCTA AAGACA [2650]	AAAGAACACGATATT CACGG [2651]
118	<i>ermC</i>	Adenine methylase	4138444	846	ACACAGTCAAACT TTATTACTTCA [2638]	CAACAAGTTTATTTT CTGTAGTTT [2639]
119	<i>msrS A</i>	Macrolide antibiotic resistance	3892641	854	GACAGATTTTCGAT CCCTTA [2654]	CCTTTTGTGTTTGAT GCACT [2655]
120	<i>mecA</i>	Penicillin bin- ding protein 2'	13785452	802	AGTTGTAGTTGTCTG GGTTTG [2550]	TGAAGTCGCTTTTCC TAGAG [2551]

S. aureus, *E. coli* and *P. aeruginosa* genes were selected from the literature and databases, and compared by BLAST analysis to all other sequences available in the

NCBI database. Primers were designed to amplify gene segments of 200-810 bp length and devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J., Russel D.W., Molecular Cloning: A Laboratory Manual. Cold Spring Harbor Laboratory Press, NY (2001)).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 120 recombinant plasmids containing *S. aureus*, *E. coli* and *P. aeruginosa* gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nL DNA (with a concentration of about 0.1 to about 0.2 ng/nL) per spot was spotted onto the slide with a Biorobotics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 1.5: Hybridisation and scanning

All experiments described represent dual co-hybridisations of two different target DNA samples labelled respectively with Cy3, Cy5 or Alexa647. After removal of unbound label, Cy3 and Cy5/Alexa647 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilised in the dark. Prior to hybridisation the target DNA was reconstituted in 33 µl H₂O and 55 µl 2x hybridisation solution (Memorec Biotec GmbH, Cologne, Germany) and chemically denatured with 11 µl denaturation buffer D1 (Mirus) and neutralized with 11 µl buffer N1 (Mirus) according the instructions of the supplier. Hybridisation was automatically performed with a TECAN Hybridisation Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 60°C for 1 min with 0.2% SDS and 4x SSC and prehybridised in 120 µl denatured prehybridisation buffer (Memorec) for 30 min at 60°C at mild agitation. After injection of 110 µl labelled DNA, hybridisation was performed at 60°C for 18 hours at mild agitation. The arrays were washed at 50°C in primary

wash buffer (Memorec) - five cycles of 1 min wash time and 30 s soak time - and in secondary wash buffer (Memorec) - five cycles of 20 s wash time and 30 s soak time -, and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridised arrays were scanned with a Scan Array 5000 laser scanner (PerkinElmer). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5/Alexa647 dye, respectively. Fluorescent images were analysed by the ImaGene software (BioDiscovery, El Segundo, CA, USA).

Example 1.6: Specificity

In order to allow the simultaneous and rapid identification of *S. aureus*, *E. coli* and *P. aeruginosa* grown in blood culture specimens from septicemic patients, a microarray comprising a set of 40 *S. aureus*, 31 *E. coli* and 49 *P. aeruginosa* gene probes of 200 to 810 bp length was developed (Tab. 2).

The specificity of the DNA-chip was validated firstly (compare Example 1.1) with 45 well characterised clinical isolates and reference strains of the three target species as well as other related bacteria and secondly (compare Example 1.2) with 13 blood cultures from sepsis patients.

In all assays, three PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridised with the corresponding probes, indicating that labelling and hybridisation had performed efficiently.

Hybridisation experiments with *S. aureus*, *E. coli* and *P. aeruginosa* target DNAs, respectively, revealed specific hybridisation with the species-specific gene probes (Fig. 1). There was no cross-hybridisation between the three species with the exception of the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C), which hybridised also with *E. coli* and *P. aeruginosa* target DNA.

Identification of *E. coli*, *P. aeruginosa* and *S. aureus* reference strains, clinical isolates and blood cultures (BC) by microarray analysis corresponded by 100% with the conventional identification results (Fig. 1).

Example 1.7: Detection and discrimination

Example 1.7A: Detection and discrimination of *E. coli*

All DNA samples from 9 *E. coli* strains hybridised always with seven *E. coli* gene probes (*envZ*, *fes* (1) and (2), *nfrB*, *yach*, *yagX*, *ycdS*) (Fig. 1A, columns 19 to 27);

in the following these genes are designated as core genes. With 14 *E. coli* gene probes variable hybridisation was observed including the antibiotic resistance gene probes *bla-TEM106*, *sul*, *strB* and *aacC2*. Such a variable hybridisation profile is expected for antibiotic resistance genes since acquired resistance to antimicrobials is strain specific. For 11 *E. coli* virulence gene probes (*eae*, *eltB*, *escR*, *escT*, *escU*, *espB*, *hlyA*, *hlyB*, *SLTII*, *toxA-LTPA*, *VT2vaB*) no hybridisation signals were detected with any of the tested *E. coli* isolates and blood cultures. Since these virulence genes are known to be specific for particular *E. coli* pathotypes (Bekal, S. et al., J. Clin. Microbiol., 41:2113-25 (2003)), it was not surprising that they were not present in the tested strains. The *eae*, *esc* and *esp* genes for example are encoded on a chromosomal pathogenicity island, which is typical for enteropathogenic *E. coli* exhibiting the unique virulence mechanism known as attaching and effacing (AE) (Elliott, S.J. et al., Mol. Microbiol., 28:1-4 (1998)). The alpha-hemolysin (*hly*) operon is encoded on a large plasmid of enterohemorrhagic *E. coli* strains (Schmidt, H. et al., Infect. Immun. 63:1055-61 (1995)).

Example 1.7B: Detection and discrimination of *Pseudomonas aeruginosa*

DNA samples obtained from *P. aeruginosa* uniformly hybridised with 32 out of 49 *P. aeruginosa* specific gene segments including the *mexA* gene probe (core genes). Variable hybridisation was observed with 17 probes allowing for discrimination of individual *P. aeruginosa* isolates (Fig. 1B, columns 12 to 18).

Example 1.7C: Detection and discrimination of *S. aureus*

Hybridisation experiments performed with 11 *S. aureus* target DNAs revealed signals in all assays with 16 *S. aureus* gene segments (core genes) (Fig. 1C, columns 1 to 11). Variable hybridisation was observed with 14 *S. aureus* gene probes including the 6 antibiotic resistance gene segments *aadD*, *aacA-aphD*, *blaZ*, *dfrA*, *ermA* and *mecA* and the virulence genes *sak*, *sea*, *sec1* and *EDIN*. The gene probes *geh*, *mreA*, *clfB* and *elkT-abcA* hybridised with 8, 10 (*mreA* and *clfB*) and 6 target DNAs respectively. However, PCR amplification of the four genes was positive for all 11 *S. aureus* target DNAs (not shown) suggesting that the four genes were present in all strains investigated and that these gene probes did not allow reliable detection of the four genes in *S. aureus*.

No hybridisation was observed with 10 probes including the toxin genes *seb*, *tst* and *etb*. In contrast to the community-acquired, multi-susceptible MRSA strain

MW2 that hybridised to *mecA* and *blaZ* only, all six clinical MRSA strains showed the same multiresistant hybridisation pattern and their DNA hybridised to *ermA* (erythromycin resistance), *mecA* (oxacillin resistance) and the *aadD* gene (tobramycin resistance). As for the majority of multiresistant MRSA strains the *ermA* and *aadD* genes were shown to be located upstream and downstream, respectively, of the *mecA* gene in the *mec* chromosomal region (Chambers, H.F., Clin. Microbiol. Rev., 10:781-91 (1997); Polyzou, A. et al., J. Antimicrob. Chemother., 48:231-4 (2001)). Hybridisation to the core gene probes permitted the identification of *S. aureus*, while hybridisation to antibiotic resistance gene probes allowed for discrimination of strains.

Example 1.7D: Discrimination of *E. coli*, *P. aeruginosa* and *S. aureus* from related bacterial species

Co-hybridisation experiments performed with related bacterial species confirmed the high specificity of the DNA-chip (Fig. 1): For *S. epidermidis* and all other Coagulase-negative staphylococci, cross-hybridisation was observed only with the *S. aureus* 16S rRNA gene probe (16SSa, Fig. 1C) and several common staphylococcal antibiotic resistance determinants (*aadD*, *aacA-aphD*, *aph-A3*, *blaZ*, *cat*, *dfrA*, *ermA*, *ermC*, *mdrSA*, *mecA*) (Fig. 1C, columns 28 to 36). There was no cross-hybridisation with other metabolic or virulence genes of *S. aureus*.

The *Micrococcus* spp. isolate showed no hybridisation with the DNA-chip (column 53). Streptococci (column 56 to 58) and enterococci (columns 54 and 55) showed hybridisation with the staphylococcal 16S RNA gene probe and once with the staphylococcal *aph-A3* aminoglycoside resistance gene probe (*Enterococcus* spp.) (Fig. 1C). Out of 12 strains of seven Gram-negative species (columns 41 to 52), two hybridised with the *S. aureus* 16S rRNA gene probe (*Klebsiella pneumoniae* and *Proteus mirabilis*, Fig. 1C, columns 41 and 47) and one clinical isolate of *Proteus mirabilis* hybridised with the *E. coli* resistance genes *bla-TEM106* (β -lactam resistance), *sul* (sulfonamide resistance) and *strB* (streptomycin resistance) (Fig. 1A, column 42). *Serratia*, *Stenotrophomonas*, *Acinetobacter* and *Enterobacter* species showed no cross-hybridisation with any gene probe.

Example 1.8: Sensitivity

While the majority of *P. aeruginosa* probes allowed unambiguous identification, some probes showed variable hybridisation patterns when microarray hybridisation

was performed with different target DNA samples prepared from the same isolate (Tab. 3).

Tab. 3: Microarray hybridisation signals obtained with different target DNA preparations of *Pseudomonas aeruginosa* isolates.

	Isolate									
	C4242			C3853		C3045		C3755		
DNA amount [ng]	130 ^a	382 ^a	1350 ^b	510 ^a	>2400 ^b	550 ^a	2950 ^b	1180 ^b	>1600 ^b	
BDR ^c	22	75	48	29	30	90	41	139	40	
No. of hybridised gene probes ^d	38 (88%)	31 (72%)	43 (100%)	36 (88%)	41 (100%)	34 (89%)	38 (100%)	41 (95%)	43 (100%)	

^a Labelled with Alexa647

^b Labelled with Cy3 or Cy5

^c BDR: Base to dye ratio; number of nucleotides per one dye molecule

^d Number of signals obtained with *P. aeruginosa* capture probes (total 49) after hybridisation with different DNA preparations. The percentage of specific hybridisations is compared to the highest number of signals obtained for each isolate (100%).

Successful hybridisation with strong fluorescent signals depends on efficiency of DNA labelling (ratio of bases per one dye molecule) and amount of labelled DNA. For the different target DNA preparations of four clinical isolates, variable hybridisation was observed with 14 gene probes (*uvrDII*, *vsmI*, *pa1069*, *rhIR*, *rhIA*, *rhIB*, *1046*, *pyocinS*, *pyocinS1im*, *plcR*, *plcN*, *PHZb*, *rbf303* and *pIIAp2*). For example, for three different DNA preparations of isolate C4242, hybridisation to *Pseudomonas*-gene probes varied from 31 to 43 probes, respectively, depending on the labelling efficiency and amount of DNA (Tab. 3). The lowest number of signals was detected with 382 ng target DNA, that, however, showed a high base to dye ratio of 75. Overall, the results suggest that varying amounts of DNA and base to dye ratios influenced the hybridisation results of few gene probes. However, irrespective of the varying quality and quantity of the labelled target DNA, 35 of the 49 *P. aeruginosa* gene probes showed robust hybridisation results in all performed experiments.

Example 1.9: Detection and characterisation of pathogens in blood cultures

Although DNA prepared from blood cultures comprises a mixture of human and bacterial DNA, the resulting hybridisation signals obtained with DNA from 1 ml positive blood culture allowed a clear and unambiguous characterisation of *S. aureus*, *E. coli* and *P. aeruginosa* present in 13 tested blood specimens (Fig. 1). In accordance to the VITEK2 characterisation, positive BACTEC® cultures were identified by microarray hybridisation as multi-resistant MRSA (Fig. 1C, column 8), penicillin-resistant *S. aureus* (column 9 and 11), multi-susceptible *S. aureus* (column 10), *E. coli* (Fig. 1A, columns 26 and 27), *P. aeruginosa* (Fig. 1B, column 18), and discriminated from oxacillin resistant *Staphylococcus epidermidis* (columns 33-35), *Proteus mirabilis* (column 43) and *Streptococcus pneumoniae* (columns 57 and 58).

Example 1.10: Correlation between susceptibility testing and microarray hybridisation of selected antibiotic resistance genes

S. aureus: For 11 *Staphylococcus aureus* strains and blood cultures, susceptibility results determined by the VITEK2 system, Etest strips and disk diffusion tests were compared with the results of the microarray hybridisation assay for the simultaneous detection of antibiotic resistance genes (Tab. 4). The presence or absence of resistance genes as indicated by microarray hybridisation was confirmed by PCR with gene specific primers (results not shown).

Tab. 4: Correlation between phenotypic and genotypic antibiotic resistance for 11 *S. aureus* isolates and blood cultures.

a) Penicillin resistance ^a		Hybridisation with <i>mecA</i> / <i>blaZ</i>	
		No. pos.	No. neg.
10 (resistant)		10	0
1 (susceptible)		0	1
b) Oxacillin resistance		Hybridisation with <i>mecA</i>	
		No. pos.	No. neg.
7 (resistant)		7	0
4 (susceptible)		0	4
c) Erythromycin resistance		Hybridisation with <i>ermA</i> , <i>ermC</i> or <i>msrA</i>	

	No. pos.	No. neg.
6 (resistant)	6	0
5 (susceptible)	0	5
<hr/>		
d) Tobramycin resistance	Hybridisation with <i>aadD</i>	
	No. pos.	No. neg.
5 (resistant)	5	0
6 (susceptible)	0	6
<hr/>		
e) Gentamicin resistance	Hybridisation with <i>aacA-aphD</i>	
	No. pos.	No. neg.
0 (resistant)	0	0
11 (susceptible)	0	11
<hr/>		
f) Trimethoprim resistance	Hybridisation with <i>dfrA</i>	
	No. pos.	No. neg.
1 (resistant)	0	1 ^b
10 (susceptible)	0	10

^a Number of strains tested for resistance

^b *dfrA* gene detected by PCR

For the *S. aureus* strains there was a 100% correlation between phenotypic resistance to penicillin and hybridisation to the *mecA* and/or *blaZ* gene (both genes confer resistance to penicillin, Tab. 4a). Phenotypic resistance to oxacillin correlated 100% with the hybridisation of the *mecA* gene (Table 4b), between resistance to erythromycin and hybridisation to the erythromycin resistance genes *ermA*, *ermC* or *msrSA* (Tab. 4c) and between resistance to tobramycin and hybridisation to the *aadD* gene (Tab. 4d). Furthermore, they all showed 100% correlation between phenotypic susceptibility to gentamicin and no hybridisation to the resistance genes *aacA-aphD* (Tab. 4e). Notably the *dfrA* gene of the trimethoprim resistant strain MW2 (MIC of 1 µg/ml) was not detected by microarray hybridisation (Tab. 4f), whereas PCR amplification revealed the presence of the *dfrA* gene.

E. coli and other Gram negative bacteria: The prototype microarray harboured only

four *E. coli* and one *P. aeruginosa* resistance gene probes which do not yet allow a comprehensive prediction of antibiotic resistances. Nevertheless, hybridisation with the *E. coli* resistance gene probe *blaTEM106* was observed in one *P. mirabilis* and four *E. coli* strains and correlated with phenotypic ampicillin resistance for all five strains (Tab. 5).

Tab. 5: Correlation between ampicillin/penicillin resistance, gentamicin/tobramycin resistance and streptomycin resistance and hybridisation with the resistance gene probes *blaTEM-106*, *aacC2*, *aph-A3* and *strB*, respectively.

Species	Resistance phenotype ^a	Hybridisation with			
		<i>blaTEM-106</i> ^b	<i>aacC2</i> ^b	<i>aph-A3</i> ^c	<i>strB</i> ^b
<i>E. coli</i> ATCC 25922	susceptible	-	-	-	-
<i>E. coli</i> C4821	AMP, STR	+	-	-	+
<i>E. coli</i> F3437	AMP	+	-	-	-
<i>E. coli</i> C3941	AMP, STR	+	-	-	+
<i>E. coli</i> F1806 ^d	AMP, GEN, TOB, STR	+	+	+	+
<i>E. coli</i> C4547	AMPi	-	-	-	-
<i>E. coli</i> C4230	AMP	-	-	-	-
<i>E. coli</i> C3940	susceptible	-	-	-	-
<i>E. coli</i> F1642 ^d	STR	-	-	-	+
<i>P. mirabilis</i> C4024	AMP, STR	+	-	-	+
<i>P. mirabilis</i> C4403	susceptible	-	-	-	-
<i>P. mirabilis</i> F1738 ^d	susceptible	-	-	-	-

^a AMP, ampicillin; GEN, gentamicin; STR, streptomycin; TOB, tobramycin; i, intermediate

^b *E. coli* gene probes

^c *S. aureus* gene probes

^d Positive blood culture

One *E. coli* blood culture showed also resistance to tobramycin and gentamicin. This phenotypic resistance correlated with the hybridisation of the *aacC2* gene probe for aminoglycoside resistance and the *S. aureus aph-A3* probe for tobramycin/kanamycin resistance (Tab. 5). For one *P. mirabilis* and four *E. coli*

strains, phenotypic resistance to streptomycin correlated with hybridisation to the *strB* probe (Tab. 5).

All *P. aeruginosa* strains hybridised with the *mexA* gene probe (Fig. 1) and showed phenotypic resistance to tetracycline, trimethoprim/sulfamethoxazole, penicillins (ampicillin, mezlocillin) and cephalosporines (cefazolin, cefixime, cefuroxime). The *mexA-mexB-oprM* operon is a determinant for a three component efflux system responsible for intrinsic and acquired multiresistance in *P. aeruginosa* (β -lactams, fluoroquinolones, trimethoprim, sulphonamides, chloramphenicol and others) (Poole, K., Clin. Microbiol. Infect. 10:12-26 (2004)).

10 Example 1.11: Microarray for specific detection of *S. aureus*

A) Strains and Cultures

Reference strains and clinical isolates: The following bacteria were purchased from the American Type Culture Collection (ATCC, Manassas, Va.) or the Deutsche Sammlung für Mikroorganismen und Zellkulturen (DMSZ, Braunschweig, Germany) and were used for evaluation of the specificity of the microarray: *Staphylococcus aureus* (ATCC 29213), *Staphylococcus epidermidis* (ATCC 12228; ATCC 18610), *Staphylococcus saprophyticus* (ATCC 14953), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 27853). Ten clinical MRSA (methicillin resistant *S. aureus*) isolates were obtained from the inventors' clinical routine microbiology laboratory.

Bacterial cultures: Bacterial strains and clinical isolates were plated either onto sheep blood or onto Mueller-Hinton agar from 50% glycerol stocks. One colony was then picked and transferred to 5 ml Luria-Bertani (LB) broth and cultured overnight at 37°C.

25 Blood cultures: Aerobic blood culture bottles (BACTEC® Plus aerobic, Becton Dickinson, Heidelberg, Germany) were inoculated with 100 CFU of *S. aureus* after adding 10 ml blood from healthy volunteers. A BACTEC® 9240 blood culture system (Becton Dickinson) - a continuous reading, automated, and computed system detecting the growth of microorganisms by monitoring CO₂ production - was used for incubation according to the manufacturer's recommendations. Bottles with a positive growth index were removed from the incubator, and an aliquot of 1 ml of the blood culture suspension was taken aseptically with a needle syringe. The

aliquot was equally divided, with one part for subculture on agar plates and CFU determination, and one part for DNA isolation.

Additionally, in order to test the microarray upon real conditions, samples were collected from ten clinical positive blood culture specimens cultivated under the same conditions as described above. Six of them were positive for different *S. aureus* strains and four for other bacterial species (*Staphylococcus epidermidis*, *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca*). Blood culture aliquots of 500 µl were used for DNA preparation.

B) Generation of the *S. aureus* specific microarray

About 140 gene segments of *S. aureus* genes, but also a few of CoNS (SEQ ID NO: 177,178,179), were selected from the literature and nucleotide databases in order to cover different functional categories (virulence factors, species-specific metabolic and structural features, antibiotic resistance determinants). Tab. 6 provides the complete list of selected genes with gene symbol, gene function and SEQ ID NO of the segments.

Tab. 6: Selected *S. aureus* genes, selected segments (SEQ ID NO) and primers used for segment amplification (SEQ ID NO)

Gene symbol	Functions	gene probe SEQ ID NO	Primer forward [SEQ ID NO]	Primer reverse [SEQ ID NO]
<i>atl</i>	autolysin	99	AGCTGAGACGACACA AGATCAAA [1144]	TTATATTGCGTTTCAAGA GCTGC [1145]
<i>aroA</i>	3-phosphoshikimate 1-carboxyvinyl- transferase	84	ACCTTCAATATTCGCA TCC [1114]	TATTCCGATTATTAGGCG TAG [1115]
<i>aroC</i>	Chorismatsynthase	83	ATGAGATACCTAACAT CAGGAGAATCA [1112]	GCTATTCTTCCATCTAATT TACGATCATA [1113]
<i>aroE</i>	Shikimatdehydrogenase	95	GTTATCAATTAATACA ACCCCTGAAGC [1136]	TGGAACATAATTCTCCTTC GATTGTTA [1137]
<i>aroF</i>	3-deoxy-D-arabino- heptulosonate-7- phosphate synthase	96	GTAGTTGAAAATATG CCTGTTGGTGT [1138]	ATTACACCATTAACGATA ATTGGCAT [1139]
<i>aroG</i>	Chorismat-Mutase	97	AGACTTATTATCTAAA CGTGGTGAAGTAGC [1140]	CAAATGATTTATTGCCGT CTCCTA [1141]
<i>asp23</i>	alkaline shock protein	98	AAAATTGCTGGTATC GCTGCA [1142]	GTCATTACATCATCAACTT GCATGTTA [1143]
<i>cata</i>	catalase	1	TAAATTGTTTAGATTA CAATCAGAGG [948]	TTCAAAGTTTTCGTATGTT TCA [949]

<i>clpC</i>	endopeptidase	7	AATGCTGCTAACCTG CGTGAT [960]	CACGTCTAACCGCTTTAC TGATTG [961]
<i>clpP</i>	endopeptidase	8	AAAGTAAAGAGTAGA CTAAGCTGTCTGCTC [962]	ACCTAATAAAATTCAAGC ATTGGGA [963]
<i>ctaA</i>	cytochrome biosynthesis	9	AAGAATTTAAATGGT TAGGTGTCGTA [964]	ACGTAATCGTTTTGTTGC CAAATA [965]
<i>ctsR</i>	transcription repressor of class III stress genes homologue	10	AACGTCCCATGCCATT AATTTT [966]	TTGCGTTTCTATTTAGCTC AGACA [967]
<i>dltA</i>	D-alanine-D-alanyl carrier protein ligase	11	ACAGAGCAGCAAAAG CGTTAGTG [968]	GACCTTGAATGAACCATT GACCAT [969]
<i>dltB</i>	hypothetical membrane transporter	12	CATATGGTGATTTTAC ATTCTTCTTAATTG [970]	CCTAACCATGTACTTTGT AACACTTTCA [971]
<i>dltC</i>	D-alanyl carrier protein	13	AAATTTATTAGCAGAA GTAGCAGAAAATG [972]	CTGAACTCTTCTAATGCTT CAACGATT [973]
<i>dnaK</i>	Heat-shock-protein	14	TTAGGCGAAAATATT GGTGAAGA [974]	TTTGTCGTCGTCTTTTACT TCGTT [975]
<i>elkT</i>	lantibiotic epilancin K7 translocator	15	GGTCTTATCGTTGCA GCTATCACTAT [976]	GAGCGTATCGCATAAATA ATCTTTTC [977]
<i>eno</i>	2-phosphoglycerate dehydrogenase	87	CGATGTTTCATTGG TACTGGTA [1120]	GGTGTTACTAAAGCAGTT GAAAACG [1121]
<i>glnA</i>	glutamine synthetase; belongs to the femC locus	17	TAGTCACCATGAAGTT GCCCC [980]	CCTCTTGAAGATGGTACA CGGAT [981]
<i>glnR</i>	glutamine synthetase repressor; belongs to the femC locus	18	CGAATGATGCAATCA GACGAAA [982]	CACCACGATTTATTGGCA AAGTT [983]
<i>grlA</i>	DNA topoisomerase IV subunit A	19	TTGAATCACCAAATTG AGGTTGT [984]	CAGTCGTTTCAAGTTTGA TTTCTTT [985]
<i>grlB</i>	gyrase-like protein beta subunit B	20	AAATCCATCGAGATG GTAATATATATCA [986]	AAACTTAAATACTTTCTG AATATTGATCAT [987]
<i>groEL</i>	stress response; heat shock protein	21	GTATGCAATTTGATCG TGTTTAT [988]	TGTTAATGCATCGCCTTC AAC [989]
<i>groES</i>	stress response; heat shock protein	22	ATGTATGTTAGCACTC TTTAATGTAAAGTG [990]	GTTTAGTTGTGTTTCATT TCGTT [991]
<i>gyrA</i>	DNA gyrase subunit A	60	CATCATTAATTCGATT CCCTGAAT [1066]	TCATTTACTTCATCTGCAT CCTCTT [1067]
<i>gyrB</i>	DNA gyrase subunit B	61	TCAATTTGACTTAAAA GAAGTTGGC [1068]	AAGATTTGTGGCATATCC TGAGTTA [1069]
<i>hemA</i>	Glutamyl-transfer RNA reductase	23	TGTCATATTATCAACA TGTAATCGAACTG [992]	AATATCAGTAATTCCAGA ACCAAGAAGAT [993]
<i>hemB</i>	Porphobilinogene synthase	62	TTGATAGACATAGAA GATTGAGATCATCAG [1070]	ACTTGAGAAATTGCTGTT TTAACAAGTAG [1071]
<i>hemC</i>	Porphobilinogene deaminase	63	GTAATTAGTCGTTG GCTCCAGAAG [1072]	GGGATAGTGGTGTATGTG TTTTAGAAATA [1073]

<i>hemD</i>	Uroporphyrinogene III synthase	64	TGTTGATAACATTGCT GTGATAGGAA [1074]	AATGCATCGATTTGTTGA TGTTCTA [1075]
<i>hemE</i>	Uroporphyrinogene decarboxylase	24	AAAATGATCAAAGGT GAAGAAACATC [994]	AATCCTCGACATTTAATG CACCTAC [995]
<i>hemH</i>	Ferrochelataase	25	AATGGGATTATTAGTT ATGGCTTATGG [996]	GTGGATATGGATCATTAT TCTTTTCG [997]
<i>hemL</i>	GSA-1-Aminotransferase	26	ATGAGATATACGAAAT CAGAAGAAGCA [998]	CTAATCTTAAAGTATCCAA TGTAGCTTCTGTA [999]
<i>hemN</i>	oxygen-independent coproporphyrinogen oxidase	65	ACAGAATCAACCTGT AGATGAGTACTTAGA T [1076]	TGATATTTCGTATAACGCA CACCATC [1077]
<i>hemY</i>	putative involved in a late step of protoheme IX synthesis	27	AAACAGCAAGATCCT AATATTGATGTAAC [1000]	CTCTACGTACAATCGATA CTAATTCATTATCT [1001]
<i>lepA</i>	GTP-binding protein	28	ATTAACAAAATTGATT TACCTGCTGC [1002]	CTATAACCAAAACCTAAT GCTTGTGAC [1003]
<i>lrgA</i>	holin-like protein LrgA	29	AAAGACGCATCAAAA CCAGCA [1004]	GGCTAATGACACCTAAAG AGTTAACAAC [1005]
<i>lrgB</i>	holin-like protein LrgA	30	GATTAACCACTTAGCA CTAAACACACCT [1006]	AATGTTTAAACAAGCACTT CACGCT [1007]
<i>lytM</i>	peptidoglycan hydrolase	31	CGACAAACACCCAAC AAGCA [1008]	TGGCTGTTATACGCTTGG TTGT [1009]
<i>menB</i>	naphthoate synthase	32	GTTATCGTATTAACCTG GTGAAGGTGATT [1010]	ACATTTAGTACATTACCG CCACCTAC [1011]
<i>menC</i>	o-succinylbenzoic acid synthetase	69	TTTAAGTCACAAATTG TAACACCGAA [1084]	TTAATTTAATTCTGGTCG GCTTTGT [1085]
<i>menD</i>	2-Succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylase	33	CGTAAGGGGAAGTAGT TATCAGTCCG [1012]	TTAGCTGTATACTCGAAA TCCAATCC [1013]
<i>menE</i>	O-succinylbenzoic acid-CoA ligase	34	ATGGACTTTTGGTTAT ATAACAAGCAC [1014]	TATTTCAAGCAATGTCACC CGTATTA [1015]
<i>menF</i>	Isochorismate-Synthase	35	ATTGATAATTTACATC CAACACCTGC [1016]	TCACTATCTGGATCAGAA TCTTTAACAAT [1017]
<i>murC</i>	UDP-N-acetylmuramoyl-L-alanine synthetase	70	CTTGGGGTGATGATG AACATCTA [1086]	AAGTGTGTGGTTGAAATA CTGCAA [1087]
<i>mutL</i>	DNA mismatch repair protein	38	TCGTTTACATCATAAT AATCATCAGAC [1022]	ACACAGAGAATAACCAGG AGAAGA [1023]
<i>mutS</i>	DNA mismatch repair protein	39	TTGTAATTCACCTTAAC TTCACCAATG [1024]	TCAAGTTGCGAAATTAGC TGA [1025]
<i>pbp</i>	porphobilinogen synthase	41	GGTGTTCCAAACCTCA AAAGATGATATA [1028]	TTGACACCATAACTCATT TAGGAATATTG [1029]
<i>pdhB</i>	pyruvate dehydrogenase (lipoamide): subunit E1beta	43	TGACATTTCAAATCAA TCACATCG [1032]	TTGGTAACCAAACATTTTC AGCTT [1033]

<i>pdhC</i>	dihydrolipoamide acetyltransferase: subunit E2	44	CTGGAGATACTATTG AAGAAGACGATG [1034]	TTGCTTTTACAGTTCTGTT TTCATCTAC [1035]
<i>pdhD</i>	dihydrolipoamide dehydrogenase: subunit E3	72	CAGGTAAATTAGTTGT AGTTGGTGGAG [1090]	AGTGGTAAACCTGGAACG ATATCA [1091]
<i>rpoB</i>	RNA polymerase B-subunit	73	ATTGTTACGTGCATTA GGTTTCTCA [1092]	TTTCTACTGGCTCGTCTAT AACGC [1093]
<i>rsbU</i>	putative operon encoding alternate sigma factor	45	TAGTTATCGAGATTAT CAAAGATTGGTAGA [1036]	GTAATTGTGAGTGTCCAT AAGAATCCA [1037]
<i>rsbV</i>	putative operon encoding alternate sigma factor	46	TGAATCTTAATATAGA AACAACCACTCAAG [1038]	ACGATCTGACACACCTAA AATGTA [1039]
<i>rsbW</i>	putative operon encoding alternate sigma factor	47	TCTAAAGAAGATTTTA TCGAAATG [1040]	CCCACATTGTTATTTTCTT TGTAT [1041]
<i>sdrC</i>	serine-aspartate repeat protein multigene family	139	GAAAGTATTCTGTAG GTACTGCTTC [1224]	CCTTTATCAATCGCAATG TC [1225]
<i>sdrD</i>	serine-aspartate repeat protein multigene family	140	CGGGCAAATAAATAA AGATG [1226]	AACTGAAGATAAGCCGTT TG [1227]
<i>sdrE</i>	serine-aspartate repeat protein multigene family	141	TCTGTCGCAGTTTTAT CAGTTGAAG [1228]	GCAAAACAAGATGATGCA ACG [1229]
<i>sgp</i>	G protein	48	TGAGATAGATGCAAT CATGTTTATGG [1042]	GAAATAGGTACAATCTCT GTAAAGTCCATATA [1043]
<i>sigB</i>	sigma factor B	78	GATGGTTCAACTGTTA CGCTATTA [1102]	CTCTGAAGTCGTGATACA TGCA [1103]
<i>sirR</i>	sit operon metal dependent repressor	49	AATATAATTGGGAAG AAGTACATCAAGAAG [1044]	ATATTAGCAAATCGGTCT TATCTCTCA [1045]
<i>sodA</i>	superoxide dismutase	50	TTGAATTACCAAAT ACCATACG [1046]	CTCCCAGAATAATGAATG GTTTAAAT [1047]
<i>sodB</i>	superoxide dismutase	51	GCGCATTTTGAAAAG GCA [1048]	GGGATAGCACGTAAAAGT GGAA-[1049]
<i>srtA</i>	transpeptidase; sortase that anchors surface proteins to the cell wall	91	CTGGTCCTGGATATA CTGGTTCTTT [1128]	GATTAATGACAATCGCTG GTGTG [1129]
<i>sstA</i>	iron transport proteins	52	TTCGTTGTTTCATAGGT GCGAGT [1050]	CTTTGAACAGCACTCGTG CG [1051]
<i>sstB</i>	iron transport protein	53	TATTGCCTTATTTAGA TGTATTGCTTTT [1052]	TCGTAGCTTCAAACACAT TTCAA [1053]
<i>sstC</i>	iron transport protein	54	AATCAAATGATATTGG AAGATATTAGCA [1054]	TATTCAGTATCTTGTGCTA TTGTCATTG [1055]
<i>sstD</i>	iron transport protein	55	CATGCGGTAACAATT CTGATAAAGA [1056]	AATTTTCGCTTTAGGTGC AGCT [1057]

<i>stpC</i>	Potential ABC transporter	92	TTAACAATAGAACATT TAACAAAGAAG [1130]	CTCGAAATTAAGAAAGTA ACACC [1131]
<i>tag</i>	DNA-3-methyladenine glycosidase	81	GCATTTGGTACTAAA GATCCAGTCTACT [1108]	AACGAAAATACTGTTACT GGACCTAAAA [1109]
<i>trx</i>	thioredoxin reductase	56	GCTGACTATGAAGGT AAAGCTGACA [1058]	CAGCTAAGTTTTCTTTTG GTTGGA [1059]
<i>tyrA</i>	prephenate dehydrogenase	82	ATTCATTTAGTCAGTG GTCATCCAAT [1110]	GCTGTCTGAATCATTCTA AAATATACGT [1111]
<i>yhiN</i>	yhiN-protein	57	CAATTGGCTTTCGATT ATTGTTGTA [1060]	AACCAATGATCTAGTGTA AATGTTAAACCT [1061]
	Virulence Factors			
<i>clfA</i>	clumping factor A	3	GCTTCAGTGCTTGTA GGTACGTTAA [952]	TTGATTCACTAATTCCTCC GCAT [953]
<i>clfB</i>	clumping factor B	4	TAATGATACATCTGAT ATTAGTGCAAACAC [954]	TTTAGCATCAGCAGCATT TACTACC [955]
<i>cna</i>	collagen adhesin	85	TCGAGGAATTAACAA AGGTC [1116]	ATCAGGTTTAGTTGGTGG TG [1117]
<i>coa</i>	staphylocoagulase	5	TGTTAGGGATACACA ACATAAACTGA [956]	GATTTTGTTCAGATTCAC CGTATTT [957]
<i>ebpS</i>	cell surface elastin binding protein	86	GAACCTAGCCATCAA GACAG [1118]	GCATTATTAGAGGCATGT GG [1119]
<i>EDIN</i>	Epidermal cell differentiation inhibitor	113	TATCTTTAGCATTAAG CGTTTATTCAAT [1172]	TTTCTAACTAGATTTTCAT CATACTGGC [1173]
<i>eta</i>	exfoliative toxine A precursor	114	TGCATTTAATTTACCA AAAGAGCTT [1174]	TGGATAGCCTATTAATTC GAGTTTG [1175]
<i>etb</i>	exfoliative toxine B precursor	115	AAGAGCTTTATACACA CATTACGGATAA [1176]	CAAAATATTGAGAATCAT TGAACATTTT [1177]
<i>fbpA</i>	fibrinogen binding protein	88	CTCTTTTACCTTTGA CGTTGGATT [1122]	GCCAAAATAGTGCTTCAA TATCAGA [1123]
<i>fib</i>	fibrinogen binding protein	89	GCTTTTCTGTGTGCAC TGACAGT [1124]	AGCGAAGGATACGGTCC AAG [1125]
<i>fnbA</i>	fibronectin-binding protein	93	TTACATCTGTACCCGT TTCCACTT [1132]	AAACTGCACAACCAGCAA ATATAGA [1133]
<i>fnbB</i>	fibronectin-binding protein	90	CCGCCTTAATTCCTTC TCCAAA [1126]	GCGAGTTGATTTGCCATC GG [1127]
<i>geh</i>	lipase precursor; glycerol ester hydrolase	59	GAACAAGGGAATGCG ATAACG [1064]	AGGTGCAGTTTTATCATT AGACGG [1065]
<i>hla</i>	alpha-hemolysin	120	ATGATGAAAATGAAA ACACGTATAGTC [1186]	ATTTGAGCTACTTCATTAT CAGGTAGTTG [1187]
<i>hlb</i>	beta-hemolysin	121	TGTTAATAAAGGCACT CCAGAGTTC [1188]	CTTTGATTGGGTAATGAT CTGAAAA [1189]
<i>hld</i>	delta-hemolysin	110	TTTTATCTTAATTAAG GAAGGAGTGATTC [1166]	TAGTGAATTTGTTCACTG TGTCGATAA [1167]

<i>hlgA_C</i>	gamma-hemolysin component A; C-terminus	117	ACTGAAGTAGAAAGT CAGAACTCTAAAGGT [1180]	GTGTTTTCCAGTTCACCTC ATATTTAACT [1181]
<i>hlgA_N</i>	gamma-hemolysin component A; N-terminus	116	CTTAAATTAATAGAAAGT [1178]	ATGTTTTGAGTTATAGCT AATCGTT [1179]
<i>hlgB</i>	gamma-hemolysin component B	118	ATAGCTTCCACCCAAC ATATGGTAA [1182]	ATTTCACTTTGTGATTTTC CCAATC [1183]
<i>hlgC_C</i>	gamma-hemolysin component C; C-terminus	119	AATCAGCATTTGATAG CGATTTATTT [1184]	CCAATTGACTTCATATTTTC ACAGTGTA [1185]
<i>hysA</i>	hyaluronate lyase	111	AAACATCAAATCGCT GTGGCT [1168]	GTGAAAGATGCCCTTGAG TGG [1169]
<i>IgGbg</i>	IgG-binding protein	112	GGGTTCTTGCTGTCTT TAAGTGATT [1170]	TATATCTCGAAGTTGCTA GTTGGGG [1171]
<i>lip</i>	lipase; glycerol ester hydrolase	68	TTTTAAGTGGTGGAC AAGCAAA [1082]	GATTGTTATTAGCGTTTG AATCTTGAC [1083]
<i>lukF</i>	leucocidin F	122	CATATGGCAGAGATA GTTATCATTCAACT [1190]	GATGTATGAGTTGCTCTT ATGTGATCTTTA [1191]
<i>lukS_C</i>	leucocidin S; C-terminus	124	AGTGTTCAATGGGGA ATAAAAGCTA [1194]	GATCCTTCTAAATAACTAT TGCCATAGTG [1195]
<i>lukS_N</i>	leucocidin S; C-terminus	123	AACATTGTCGTTAGG AATAATCACT [1192]	AATCAAAGCATCTTTGTTA TACTTT [1193]
<i>NAG</i>	N-acetyl-glucosaminidase; cytotoxin	125	ACTCAAACAGTTAGC AAGATTGCTC [1196]	TGCATTTACCCAACCACT GC [1197]
<i>nuc</i>	nuclease	71	GCGATTGATGGTGAT ACGGTT [1088]	TTTCGCTTGTGCTTCACT TTT [1089]
<i>sak</i>	staphylokinase	126	CGAGTTATTTTGAACC AACAGGC [1198]	GCGCAAAGATCGAAGTCA CTTAT [1199]
<i>sea</i>	staphylococcal enterotoxin A precursor	127	CTGATGTTTTTGATGG GAAGGTT [1200]	TGCATGTTTTTCAGAGTTA ATCGTTT [1201]
<i>seb</i>	staphylococcal enterotoxin B precursor	128	ATATATTCTATTAAGG ACACTAAGTTAGGGA AT [1202]	AGTTAGGTAATCTAATTCT TGAGCAGTCA [1203]
<i>sec</i>	staphylococcal enterotoxin C precursor	129	GGCACATGATTTAATT TATAACATTAGTG [1204]	ATTCCTAGCTTTTATGTCT AGTTCTTGAG [1205]
<i>spa</i>	immunoglobulin G binding protein A precursor	94	GGTATTGCATCTGTAA CTTTAGG [1134]	AGGTTAGCACTTTGACTT GG [1135]
<i>sprV8</i>	V8 serine protease gene	137	ACAAACGCAGTCAAG CAAACA [1220]	CATTGTTGCTGGTTTAAC TACTTCAC [1221]
<i>tst</i>	toxic shock syndrome toxin	138	AAAATTACCTACTCCA ATAGAACTACCTTT [1222]	TTTCTGCTTCTATAGTTTT TATTTTCATCA [1223]
	Antibiotic Resistance Determinants			
<i>aacA-aphD</i>	bifunctional aminoglycoside modifying enzyme	843	ACCCTCATAAAAATAA TCCAAGAGC [2632]	CTTTTTCTTTTGCATAACC TTTTTC [2633]

<i>aadD</i>	aminoglycoside acetyl transferase; kanamycin resistance	837	AAGCAGAGTTCAGCC ATGAATG [2620]	CAGATGCGATGATGCAGAC C [2621]
<i>aphA3</i>	3' 5'-aminoglycoside acetyltransferase; kanamycin resistance	845	CTGGTGGGAGAAAAT GAAAAC [2636]	CCAGTTTTCGCAATCCAC ATC [2637]
<i>blaI</i>	regulator protein	814	AGCAAGTTGAAATAT CTATGGCTGA [2574]	TCATTTAAAATGTCTCGCA ATTCTT [2575]
<i>blaR</i>	beta lactamase repressor	790	GAAAATTCACGTATGT CATGGAATC [2526]	GCATTTTTCCCAGATGGC TT [2527]
<i>blaZ</i>	beta-lactamase	827	GATAAGAGATTTGCC TATGCTTCAA [2600]	TGCTTAATTTCCATTTGC GAT [2601]
<i>cadA</i>	Probable cadmium-transporting ATPase (Cadmium efflux ATPase)	897	TTGGATAGTTCAACAA AAACATTAACA [2740]	CATTTTTATCTTCTGTTAC CACTGGTT [2741]
<i>cadC</i>	Cadmium efflux system accessory protein homolog	908	TAGCAACCTCCCTTTG ATAC [2762]	ACAAAAGATATGTGTGAA GTTACC [2763]
<i>cat</i>	chloramphenicol acetyltransferase	862	CCTTCTTTGATTTATG CAATTATGG [2670]	GAAGCATGGTAACCATCA CATACA [2671]
<i>dfrA</i>	S1 dihydrofolate reductase; trimethoprim resistance	859	ATGACATTATCAATAA TTGTCTGCTCA [2664]	AACATGACCAGATAACTC TTTAATTTTCAAT [2665]
<i>ermA</i>	rRNA methylase	852	TAGCTATCTTATCGTT GAGAAGGGAT [2650]	AAAGAAATTGTTCTTCG ATAGTTTATT [2651]
<i>ermB</i>	adenine methylase	851	AACCGATACCGTTTAC GAAATTG [2648]	CGCTTGTAGAATCCTTCT TCAACA [2649]
<i>ermC</i>	adenine methylase	846	AACACAGTCAAAACTT TATTACTTCAAAAC [2638]	TTGCATAATTTATGGTCTA TTTCAATG [2639]
<i>femA</i>	factor essential for methicillin resistance	801	TAGGATTTGAACATAC TGGATTCCA [2548]	AAAGGCACTAACACACGG TCTTT [2549]
<i>femD</i>	putative factor essential for methicillin resistance	16	TCAGGTGAAATGTTA GAATCAGCA [978]	TAAGTCACCAAATAAGAA TGGCG [979]
<i>fmhA</i>	similar to Staphylococcus aureus FemA and FemB proteins	825	GTTAACGATTGATGA AACGCAAA [2596]	TGCACCATCTTGTTCAATT TGTT [2597]
<i>fmhB</i>	essential for addition of glycine 1 to peptidoglycan precursor	818	GAGTTATTAAATAGTT TTGAACGCCG [2582]	TTCAAGGATGTTCTTTTCT AAAGCT [2583]
<i>linA</i>	lincosaminide nucleotidyltransferase	850	GATATAGGATACAAA ATAGAAGTTGATTGG [2646]	GGTCTTTTTCTGTTAATTC ATAACCG [2647]

<i>mecA</i>	penicillin binding protein 2'	802	ATATGAGATAGGCAT CGTTCCAAA [2550]	CTAATAGATGTGAAGTCG CTTTTCCT [2551]
<i>mecI</i>	mecI protein	812	TAATAAAACGTATGAA ATATCATCTGCA [2570]	TTTCATCTTGTGATAGATC TTCTTTTTC [2571]
<i>mecR</i>	mecI protein	798	TTTAAAGAATGGAAC CAAGATCAAA [2542]	TCGCCTTTTAAATGTGTA GCAAA [2543]
<i>mreA</i>	ABC transporter	907	GCAGTATTAGTACTTG ATGAACCAACG [2760]	GACAAAACGTACAGGATG TCCATAA [2761]
<i>mreB</i>	ABC transporter	36	ATGAGGTACTCTTTAA TTAGTGGTATCTTGA [1018]	ATCAGCTAATGAAATGAA GATTGCA [1019]
<i>mreR</i>	ABC transporter	37	GAAAATACAGAACTT GATGGTGAAATG [1020]	GCAAGACTCACATACACC ATAAACTTC [1021]
<i>msrA</i>	methionine sulfoxide reductase	854	TCATAAGCTGACAGA TTTTCGATCC [2654]	CTTTTAGATGAACCTACA AATCACTTGG [2655]
<i>norA</i>	quinolone resistance protein	904	TTAGCTTTCATAATGT CAGTTGTATTGA [2754]	ACAGTGTTTCAAATGCCG ATAAA [2755]
<i>pbpF</i>	penicillin-binding protein Pbp2b	42	AACACAATCGGAAAT GTTGGATAC [1030]	CTATCCCAATCCATAGAC GTGTTAA [1031]
<i>qacA</i>	quaternary ammonium compound resistance protein	885	CAATGGTTACAGGTT GTGGAAGA [2716]	GCCCACTACAGATTCTTC AGCTAC [2717]
<i>spc</i>	adenyltransferase AAD9	844	ATATCAGGAAAGATT GGAAATACGG [2634]	AAAGAGGTATAGCCCATT CTGCA [2635]

In order to obtain a high specificity level, each selected gene was compared to all other gene sequences available in the NCBI database using the BLAST algorithm. From that comparison, regions (ranging from 104 to 1434 bp) devoid of apparent homology with genes of other bacterial species and *Homo sapiens* were defined and amplified by PCR using specifically designed primers (see Tab. 6). A mixture of the total DNA from three different *S. aureus* reference strains and 100 clinical isolates was used as template for amplification of *S. aureus* gene segments, increasing therefore the chances to amplify more seldom occurring virulence and antibiotic resistance genes. PCR products were cloned into the plasmid pCR 2.1-Topo Vector (Invitrogen, Karlsruhe, Germany) which were used to transform competent *Escherichia coli* (XL-1-Blue) cells using the Calcium Chloride protocol (Seidman, C.E. et al., in: Ausubel, F.M. (ed.), Current Protocols in Molecular Biology, John Wiley & Sons, Inc. (2000)). Recombinant plasmids containing selected gene segments were screened by restriction analysis and verified by sequencing. The plasmid library constructed was used for re-amplification and production of the bulk DNA (10 µg at a concentration of 1 µM) from each clone necessary for printing the

microchips. A Microgrid II spotter (BioRobotics, Cambridge, UK) and CMT-GAPS™ coated glass slides (Corning Incorporated, Corning, USA) were used. The complete array of 140 segments of genes was spotted in 3 replicates per slide.

C) DNA purification

5 a) Sample preparation

Bacterial cultures: Overnight cultures (5 ml) were harvested at 2,560g for 10 minutes. After discarding the supernatant the pellet was washed in 1ml TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA) and recovered by centrifugation at 17,900 g for 2 min.

- 10 Blood cultures: One ml of blood culture was mixed with 1 ml 0.1% Triton®-X-100 and kept at room temperature for 5 min in order to disrupt blood human cells and resolve bacterial clumps. Bacterial cells were then harvested at 17,900 g for 10 min. Pellets were washed in 1 ml TE and recovered as described above.

b) Purification of DNA

- 15 Pellets of harvested cells were resuspended in 500 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton®-X-100). To promote bacterial lysis, lysozyme and lysostaphin (Sigma, Taufkirchen, Germany) were added to reach a final concentration of 0.8 mg/ml and 0.2 mg/ml respectively. To lyse Gram negative bacterial cells, only lysozyme in the indicated concentration was used.
- 20 Samples were then incubated for one hour at 37°C. After treatment with Proteinase K (1 mg/ml) (Sigma, Taufkirchen, Germany) for 5 hours at 55°C under mild agitation, the samples were heated at 65°C for 30 min to inactivate Proteinase K and then cooled down to 37°C. Finally, a RNase A treatment (0.2 mg/ml) was carried out for 1 hour at 37°C. A pre-treatment with CTAB
- 25 (Cethyltrimethylammonium bromide) was performed in order to release DNA from polysaccharide DNA complexes (Murray, M.G. and Thopson, W.F., Nucl. Acid Res. 8:4321-4325 (1980)). Salt concentration was adjusted to 0.7 M by adding 5 M NaCl. After thoroughly mixing, a 10% CTAB-0.7M NaCl solution was added to adjust the CTAB concentration to 1%.

The mixture was subsequently incubated under rotation for 20 min at 65°C and then extracted with one volume of chloroform/isoamyl alcohol (24:1). The samples were spun in a microcentrifuge (17,900 g) at room temperature. The aqueous phase was extracted once with chloroform/isoamyl alcohol (24:1), once with
5 phenol/chloroform/isoamyl alcohol (25:24:1) and finally with chloroform/isoamyl alcohol (25:24:1). Genomic DNA in the aqueous phase was sonified (3 x 10 s at 12% amplitude with 20 s breaks between pulses) in a Digital Sonifier (Branson, Schwaebisch Gmuend, Germany) to obtain fragments of around 1 kb, then precipitated with one volume of isopropanol and pelleted by centrifugation for 30
10 min at 4°C in a microcentrifuge at 17,900 g. The pellets were washed in 70% ethanol and resuspended in 50-100 µl TE (10 mM Tris-HCl, pH 7.5 - 1 mM EDTA). This DNA preparation was used when a high yield (hundreds of µg) was necessary, for example to prepare samples for several hybridisations experiments.

A second protocol using DNeasy Tissue Kit (QIAGEN, Hilden, Germany) adapted to
15 bacterial cells and allowing DNA preparation in two hours, was also used when fast preparation was the priority. The abbreviations below pertain to the manufacturer's abbreviations for buffers used in the kit. The bacterial pellet was resuspended in 1 ml ddH₂O and the cell suspension frozen in liquid N₂ for 1 minute and then placed in a 60° C thermo-block for 2 minutes. Such a treatment was repeated once and
20 bacteria were centrifuged again for 5 minutes at 14,000g. The resulting pellet was resuspended in 180 µl lysis buffer (20 mM Tris-HCl, pH 8.0 - 2 mM EDTA, pH 8.0 - 1.2% Triton-X-100). Specifically for *S. aureus* DNA preparation, lysostaphin (0.2mg/ml) was added and incubated 1 hour at 37°C. After, 200 µl of buffer AL (for gram positive bacteria) or buffer ATL (for gram negative) and 25 µl of the
25 Proteinase K solution delivered with the kit were added and incubated at 70°C for 30 minutes. 200 µl of 100% ethanol were added and the suspension transferred to a DNeasy Mini Column placed into a collection tube. The column was centrifuged at 6,000 g for 1 minute, washed first with 500 µl of buffer AW1, centrifuged at 6,000 g for 1 minute, washed then with 500 µl of buffer AW2, and centrifuged at 14,000 g
30 for 3 minutes. The column was then placed in a 1.5 ml tube and centrifuged once more at 14,000 g for 1 minute. DNA was eluted with 130 µl of buffer AE. After one minute the column was centrifuged at 6,000g for 1 minute. The eluate was re-

loaded in the column and centrifuged again under the same conditions in order to increase the DNA yield.

D) DNA labelling

Different amounts of DNA (5 ng to 5 µg) were labelled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50units) (both from BioPrime DNA labelling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and the probe purified either by MiniElute PCR or QIAquick Purification Kits (QIAGEN, Hilden, Germany), depending on the amount of labelled DNA applying two wash and two elution steps.

E) Hybridisation and detection procedure

All experiments described in the present example represent co-hybridisation of two different DNA samples labelled respectively with Cy3 and Cy5. Cy3 and Cy5 belong to the cyanine family of fluorophores and were used as reporter molecules. The photochemical properties of the two CyDye fluors were as follows: Absorption maximum at 550 nm and emission maximum at 570 nm for Cy3 and for Cy5 at 649 nm and 670 nm, respectively.

After purification, Cy3 and Cy5 labelled DNA were pooled and 10 µg of Salmon Sperm DNA and 50 µg of polyA DNA were added. The mixture was frozen in liquid nitrogen and lyophilized in the dark. DNA microchips were automatically hybridised in a GeneTac Hybridisation Station (Genomic Solutions, Harvard, USA) following the Corning protocol.

Shortly, 110 µl of pre-hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS, 10 mg/ml BSA) were added to each slide and incubated for one hour at 42°C. Lyophilized samples were resuspended in 110µl of hybridisation buffer (25% Formamide, 5x SSC, 0.1% SDS), denatured for 3 minutes at 90°C, added to the slides, and incubated 4 hours at 42°C. After several washing steps using successively 2 x SSC/0.1% SDS, 0.1 x SSC/0.1% SDS, and 0.1 x SSC, slides were

dried by a 2 min centrifugation step (1000 g) and read in a Scan Array 5000 (Perkin Elmer, Boston, USA) using emission filters for Cy3 and Cy5 in two separate channels. Fluorescence intensities as hybridisation indicators were then analyzed by the software ImaGene (BioDiscovery, Marina Del Rey, USA). Spots were found and segmented in order to select areas of recognizable signals for analysis. Intensity of fluorescence of each spot was measured, signal to local background ratios were calculated, spot morphology and deviation from expected spot position were considered. Cut off values for those parameters were empirically determined in pilot experiments and used to tag spots either as positive or as negative.

10 F) Validation of the detection system

The experimental approach adopted in present example required dual-dye hybridisations. It was therefore necessary to verify at first whether DNA samples from the same source, labelled with one or the other fluorochrome, would produce the same hybridisation pattern. Co-hybridisation experiments, combining two identical samples of 2 µg of *S. aureus* DNA, produced strictly similar hybridisation results whatever fluorochrome was used for labelling (Fig. 2A). For better presentation gray scale images from scanning were converted in false-colour, where green and red colour represent intensity of Cy3 and Cy5 fluorochromes respectively. All spots showed double-hybridisation - yellow colour meaning the overlay between green (here assigned to Cy3 labelled DNA) and red signals (Cy5 labelled DNA). Signal intensities from both channels strongly correlated ($r^2=0,97$) (Fig. 2B).

G) Sensitivity of detection

S. aureus DNA samples in decreasing amounts (from 2 µg to 5 ng) were labelled and hybridised in order to determine the minimum amount of DNA producing the expected hybridisation pattern for a certain strain. Such expected patterns were defined as those produced by the hybridisation of 2 µg of DNA. From 2 µg to 50 ng no significant differences in the hybridisation pattern were observed with no false negative spots. Detection of 20 ng DNA was still satisfying with only 5% of false negative and false positive. However, 5 ng of labelled DNA yielded weak signals with almost 95% of false negative spots (data not shown). The limit of sensitivity of the *S. aureus* microarray was then considered as being 20 ng DNA which

corresponds approximately to 7×10^6 *S. aureus* CFU (*S. aureus* genome 2.5×10^6 bp. 2.8 fg DNA per cell).

H) Specificity of detection

5 The specificity of the *S. aureus* microchip was demonstrated by six independently performed co-hybridisation experiments. Visual examination of pictures showing results of co-hybridisation of *S. aureus* DNA with *Pseudomonas aeruginosa* or *Escherichia coli* DNA revealed no cross-hybridisation between *S. aureus* selected gene segments and DNA probes from those Gram negative bacteria (data not shown). Transcribing these data in a bar code showing positive or negative spots
10 (Fig. 3A and B) confirmed that only the *S. aureus* DNA sample hybridised with spotted probes.

The specificity of the microarray could be demonstrated even below the genus level. As shown in Fig. 4, some spotted *S. aureus* probes cross-hybridised with *S. epidermidis* and *S. saprophyticus* DNA samples. This is not surprising as these
15 species are phylogenetically closely related. However, genes coding for *S. aureus* specific proteins as nuclease (*nuc*), clumping factors A and B (*clfA* and *B*), protein A (*spa*), V8 serine protease (*sprV8*) and alpha and beta hemolysins (*hla* and *hlb*) exclusively hybridised with *S. aureus* DNA. The presence/absence of such genes allowed unambiguous discrimination between *S. aureus* and CoNS.

20 I) *S. aureus* strain profiling

The principle of the *S. aureus* microarray was tested as a tool for strain profiling. A distinctive hybridisation pattern could be established for reference strains and
25 10 selected clinical isolates. For instance when DNA from clinical isolates T100 and T103 were labelled with Cy5 and Cy3, respectively, and co-hybridised, both isolates were identified as *S. aureus*, since both contained species-specific genes as e.g. clumping factor A and B (Fig. 5A).

Moreover, both strains are methicillin resistant (*mecA* positive), but only T100 contained the beta-lactamase gene. The hybridisation of T103 DNA reveals the presence of *ermA*, *ermB* and *aacA* genes indicating that the strain is resistant to
30 erythromycin and aminoglycosides.

Apparently, T103 harbors the genes encoding enterotoxines A (*eta*) and B (*etb*) while in T100 the gene encoding enterotoxin C (*etc*) is present. The presence or absence of these genes was confirmed by PCR assays (Fig. 5B) and the antibiotic resistance was verified by classical antibiograms (Sahm, D. & Washington, J. A. (1991). Antibacterial susceptibility tests: dilution methods. In: Manual of Clinical Microbiology (Balows, A., Ed.), pp. 1105–16. American Society for Microbiology, Washington DC, USA) (data not shown).

J) Detection of *S. aureus* in spiked positive BACTEC® cultures

One possible application of the *S. aureus* microarray is to detect the bacterium growing in blood culture, i.e. after the BACTEC® signals bacterial growth. Blood culture bottles were spiked with 100 CFU of *S. aureus*. After the automated culturing system indicated bacterial growth, 1 ml was withdrawn for DNA extraction.

As shown in Fig. 6A, DNA samples prepared from sterile blood culture show no crosshybridisation with spotted *S. aureus* probes. A 2 µg DNA sample derived from blood culture containing *S. aureus* cells revealed a hybridisation pattern almost completely identical to a DNA sample isolated from an overnight LB culture inoculated with a *S. aureus* colony (Fig. 6B).

These data underscore the high sensitivity and specificity of the detection system since blood culture DNA comprises a mixture of human and bacterial DNA. Co-hybridisation between DNA from blood culture positive for *S. aureus* and CoNS DNA also allowed clear identification since only the *S. aureus* probe hybridised to *S. aureus* species-specific genes (data not shown).

K) Detection of *S. aureus* in positive BACTEC® cultures inoculated with clinical specimens

Co-hybridisation with DNA from clinical blood cultures positive for *S. aureus* and CoNS (*Staphylococcus epidermidis*), *Streptococcus mitis*, *E. coli* and *Klebsiella oxytoca* allowed clear species identification since the *S. aureus* probes hybridised to *S. aureus* species-specific genes only. *Staphylococcus epidermidis* positive blood culture DNA hybridised to staphylococcal metabolic genes and to some antibiotic

resistance determinant genes only. No cross-hybridisation was detected between DNA from the two gram-negative strains and the *Streptococcus* strain and *S. aureus* spotted gene probes (data not shown).

Example 2.1: Materials and Methods

- 5 Reference strains, clinical isolates and culture conditions: Bacterial reference strains were obtained from the American Type Culture Collection (ATCC, Manassas, Va.), the Deutsche Sammlung von Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany), the Collection Institute Pasteur (CIP, Paris, France) or the network on antimicrobial resistance in *Staphylococcus aureus* (NARSA,
- 10 Herndon, Virginia). *Klebsiella pneumoniae* serotype O3 and serotype O8 were provided by E.M. Nielsen (Department of Bacteriology, Mycology and Parasitology, Statens Serum Institut, Copenhagen, Denmark). Clinical isolates were obtained from the inventors' clinical routine microbiology laboratory.
- The following bacteria and fungi were used for evaluation of the specificity of the
- 15 microarray: *Acinetobacter baumannii* (DSM 30008, 1 clinical isolate), *Pseudomonas aeruginosa* (ATCC27853), *Escherichia coli* (ATCC 25922, CIP 105893, 81.88, 74.14 and 3 clinical isolates), *Klebsiella oxytoca* (DSM 4798, 1 clinical isolate), *Klebsiella pneumoniae* (DSM 681, serotype O3 strain 390 and serotype O8 strain 889), *Proteus mirabilis* (DSM 788, 2 clinical isolates), *Proteus vulgaris* (DSM 2140),
- 20 *Candida albicans* (ATCC 10231), *Enterococcus casseliflavus* (clinical isolate), *Enterococcus faecalis* (ATCC 29212, 1 clinical isolate), *Enterococcus faecium* (clinical isolate), *Enterococcus gallinarum* (clinical isolate), *Streptococcus agalactiae* (DSM 2134), *Streptococcus angiosus* (DSM 20563), *Streptococcus bovis* (DSM 20480), *Streptococcus dysgalactiae* (DSM 20662), *Streptococcus gordonii* (DSM
- 25 6777), *Streptococcus mutans* (DSM 20523), *Streptococcus pneumoniae* (ATCC 49619), *Streptococcus pyogenes* (DSM 11723), *Staphylococcus aureus* (ATCC 29213, NRS123 alias MW2, 2 clinical isolates), *Staphylococcus epidermidis* (ATCC 12228, 1 clinical isolates), *Staphylococcus haemolyticus* (DSM 20263), *Staphylococcus hominis* (DSM 20228), *Staphylococcus lugdunensis* (DSM 4804),
- 30 *Staphylococcus saprophyticus* (ATCC 14953) and *Staphylococcus warneri* (DSM 20316).

Bacterial and fungal reference strains and clinical isolates were grown over night at 37 °C with constant shaking in 5 ml Luria-Bertani (LB) broth or tryptic soy broth

(TSB, 30 g/l, Merck) containing 3 g/l yeast extract. Enterococci and streptococci were grown in 10 ml TSB plus yeast without agitation under 5% CO₂. Overnight cultures were harvested at 2,560 g for 10 min. After discarding the supernatant the pellet was washed in 1 ml TE (10 mM Tris-HCl, pH 7.5 and 1 mM EDTA) and recovered by centrifugation at 17,900 g for 10 min. Cell pellets were used for DNA preparation.

Example 2.2: DNA preparation

For microarray hybridization experiments, DNA was prepared from the strains listed in Example 2.1.

Total cellular DNA was extracted and purified by using the Bacterial Genomic DNS Purification Kit (Edge BioSystems, Gaithersburg, USA). Cell pellets were resuspended in 200 µl lysis buffer (20 mM Tris-HCl, pH 7.5, 50 mM NaCl and 10 mM EDTA, pH 8.0) and lysozyme (Sigma, Taufkirchen, Germany) was added to reach a final concentration of 7.5 mg/ml. In addition, lysostaphin (Sigma) was added to a final concentration of 0.2 mg/ml to promote Staphylococcal lysis or mutanolysin (0.5 U/µl; Sigma) was added to lyse Streptococci and Enterococci. After incubation at 37°C for one hour, 400 µl Sphaeroblast buffer were added and DNA was extracted following the instructions of the supplier.

Candida albicans DNA was extracted using the MasterPure Yeast DNA purification kit (Epicentre Biotechnologies, Madison USA) following the instructions of the manufacturer.

Concentration, purity and size of the purified DNA preparations were determined by UV-spectrophotometry (lambda 40, PerkinElmer, Boston USA) and 1% agarose gel electrophoresis.

Example 2.3: DNA labelling

Prior to labelling, high molecular weight DNA (≥ 12 kb) was fragmented by sonication for 30 sec at an amplitude of 80% (energy input 1500 kJ) using an ultrasonic homogenizer (Sonoplus HD 3080, Bandelin, Berlin, Germany) equipped with a BR30 booster cup for high-intensive irradiation of small and sensitive sample volumes. The size of the fragmented DNA (500-8000 bp) was checked by 1.5% agarose gel electrophoresis. Different amounts of DNA (1 to 5 µg) were then labeled with 3 µl either of Cy5-dCTP or Cy3-dCTP (Amersham Pharmacia Biotech

Europe, Freiburg, Germany) by random priming (1 x random primer/Klenow reaction buffer) using Klenow Polymerase (50 units) (both from BioPrime DNA labeling Kit, Invitrogen, Karlsruhe, Germany) in the presence of 0.12 mM dATP's, dGTP's and dTTP's and 0.06 mM dCTP's, in a total volume of 50 µl. Prior to

5 labelling, each target DNA was spiked with three gene segments (1 µl each, 30 ng/µl) amplified by PCR from selected recombinant plasmids to serve as internal positive controls. After 2 hours incubation at 37°C, the reaction was interrupted by adding 5 µl of 0.5 M EDTA and unbound label was removed using the QIAquick Purification Kit (QIAGEN, Hilden, Germany). The purified labelled DNA was eluted in

10 80 µl TE and the relative labelling efficiency of a reaction was evaluated by calculating the approximate ratio of bases to dye molecules (acceptable labelling ratios for nucleic acid were ≤ 60). This ratio and the amount of recovered labelled DNA was determined by measuring the absorbance of the nucleic acids at 260 nm and the absorbance of the dye at its absorbance maximum using a lambda40 UV-

15 spectrophotometer (PerkinElmer) and plastic disposable cuvettes for the range from 220 nm to 1,600 nm (UVette; Eppendorf, Hamburg, Germany).

Example 2.4: Microarray construction

Cloned PCR-products were used to generate probes for the DNA microarray. All

20 together 930 gene segments ("probes") were represented on the microarray (Tab. 7). They comprised probes for virulence genes, species specific metabolic and structural genes from *Candida albicans* (86), *Acinetobacter baumannii* (21), *Enterobacter cloacae* (11), *Escherichia coli* (31), *Enterococcus faecalis* (69), *E. faecium* (23), *Klebsiella oxytoca* (21), *K. pneumoniae* (50), *P. aeruginosa* (53),

25 *Proteus mirabilis* (70), *P. vulgaris* (9), *Stenotrophomonas maltophilia* (13), *Streptococcus agalactiae* (38), *S. dysgalactiae* (1), *S. pneumoniae* (83), *S. pyogenes* (42), *S. viridans* (19, including probes for *S. mutans* and *S. bovis*), Streptococci (2), *Staphylococcus aureus* (69), *S. epidermidis* (35), *S. haemolyticus* (7), *S. hominis* (1), *S. lugdunensis* (6), *S. saprophyticus* (2) and *S. warneri* (7), as

30 well as for bacterial antibiotic resistant determinants (131), and positive and negative controls (29).

Tab. 7: Gene probes on array of example 2.

n	Probe Name	SeqID
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n	Probe Name	SeqID
1	16SKpn_1_1	934
2	16SrRNAPrmi_1_1	940
3	16SRNAEf_1_1	936
4	16SRNAEf_2_1	933
5	16SShaemolyt_1_1	938
6	16SShominis_1_1	937
7	16SStrepagalactiae_1_1	930
8	16SPa_1_1	926
9	16SSa_1_1	942
10	16SSa_3_1	935
11	16SStrepneu_1_1	929
12	16SStrepyog_1_1	928
13	16SKlox_1_1	943
14	16SrRNAPrvu1_1_1	941
15	16SEfaecium_1_1	931
16	16SEfaecium_2_1	932
17	23SEfaecium_1_1	939
18	23SEfaecium_2_1	927
19	ARHGDI(hu)_1_1	923
20	b-Act(hu)_1_1	922
21	GAPD(hu)_1_1	921
22	LDHA(hu)_1_1	920
23	PGK1(hu)_1_1	924
24	rbcL_1_1	919
25	rbcL_1_2	925
26	aac(6p)-lb7_1_1	2867
27	aacA-aphD_1_1	843
28	aacA4ENCL_1_1	2864
29	aacC2_1_1	833
30	aadB_1_2	836
31	aadD_1_1	837
32	adeA-ACIBA_1_1	2866
33	adeB-ACIBA_1_1	2868
34	adeC-ACIBA_1_1	2869
35	AdeR-ACIBA_1_1	2865
36	AdeS-ACIBA_1_1	2870
37	aph-A3_1_1	840
38	strA_1_1	839
39	strB_1_1	834
40	aacA_aphDStwar_1_1	831
41	aacA4_1_1	842
42	aacA4_1_2	838
43	aacC1_1_1	841
44	aacC1_1_2	832
45	aadA_1_1	835
46	aphA3_1_1	845

n	Probe Name	SeqID
47	ampC-ENCL_1_1	2874
48	ampC_1_1	789
49	ampR_1_1	2873
50	blaA_1_1	823
51	blaB_1_1	788
52	blaShaemolyt_1_1	803
53	blaL1_1_1	2875
54	blaL2_1_1	2871
55	blaMIR-3_1_1	2872
56	blaOXA-1_1_1	828
57	blaOXY-KLOX_1_1	816
58	blaSHV-1_1_1	794
59	blaTEM-106_1_1	815
60	blavim_1_1	804
61	blaZ_1_1	827
62	cumA_1_1	819
63	femA_1_1	801
64	femBShaemolyt_1_1	820
65	fmhA_1_1	825
66	fmhB_1_1	818
67	ftsWEF_1_1	817
68	mecA_1_1	802
69	mecISepid_1_1	786
70	pbp1a_1_1	813
71	pbp2aStrpneu_1_1	793
72	pbp2x_1_1	807
73	pbp3Saureuc_1_1	808
74	pbp4_1_1	809
75	pbp5Efaecium_1_1	810
76	pbpC_1_1	811
77	psrb_1_1	824
78	bla-CTX-M-22_1_1	792
79	bla_FOX-3_1_1	822
80	blaIMP-7_1_1	785
81	blaIMP-7_1_2	797
82	blaOXA-10_1_2	787
83	blaOXA-2_1_1	795
84	blaOXA-32_1_1	791
85	blaOXY_1_1	799
86	blaPER-1_1_1	821
87	blaPrmi_1_1	830
88	blaRShaemolyt_1_1	796
89	dacCStrpyog_1_1	800
90	fox-6_1_1	829
91	mecR1Sepid_1_1	826
92	pbp2b_1_1	805

n	Probe Name	SeqID
93	pbp2primeSepid_1_1	806
94	cat_1_1	862
95	catEfaecium_1_1	861
96	cmlA5_1_1	860
97	ble_1_1	875
98	ddl_1_1	874
99	vanRB2_1_1	870
100	vanSB2_1_1	872
101	vanWB2_1_1	873
102	vanXB2_1_1	876
103	vanA_1_1	867
104	vanB_1_1	879
105	vanC-2_1_1	881
106	vanH(tn)_1_1	866
107	vanHB2_1_1	868
108	vanR_1_1	869
109	vanS(tn)_1_1	871
110	vanX(tn)_1_1	882
111	vanY(tn)_1_1	877
112	vanYB2_1_1	878
113	vanZ(tn)_1_1	880
114	ermA_1_1	852
115	ermB_1_2	851
116	ermC_1_1	846
117	linB_1_1	847
118	mdrSA_1_1	849
119	mefA_1_1	856
120	mphBM_1_1	855
121	mrX_1_1	857
122	msrA_1_1	854
123	satA_1_1	853
124	satSA_1_1	848
125	abcXStrpmut_1_1	894
126	acrA_1_1	892
127	acrB_1_1	883
128	acrR_1_1	890
129	albA_1_1	898
130	arr2_1_1	906
131	cadBStalugd_1_1	888
132	elkT-abcA_1_1	896
133	emeA_1_1	891
134	mexA_1_1	889
135	mexB_1_2	884
136	mexR_1_1	905
137	mreA_1_1	907
138	norA23_1_1	904

n	Probe Name	SeqID
139	nov_1_1	901
140	qacEdelta1_1_1	895
141	rtn_1_1	893
142	sul_1_1	887
143	sull_1_1	886
144	sulll_1_1	2888
145	wbb1_1_1	903
146	wzm_1_1	899
147	wzt_1_1	902
148	msrCb_1_1	900
149	uvrA_1_1	909
150	tetA-ACIBA_1_1	2907
151	tetAJ_1_1	863
152	tetL_1_1	864
153	tetM_1_1	865
154	tetR-ACIBA_1_1	2908
155	dfrA_1_1	859
156	dfrStrpneu_1_1	858
157	AAF1_1_1	247
158	ALS1_1_1	249
159	ALS7_1_1	250
160	ASL43f_1_1	232
161	BGL2_1_1	233
162	CACHS3_1_1	234
163	CEF3_1_1	237
164	CHS1_1_1	238
165	CHS2_1_1	239
166	CHS4_1_1	240
167	CHS5_1_1	241
168	CHT1_1_1	242
169	CHT2_1_1	243
170	CHT4_1_1	244
171	CSA1_1_1	245
172	GSC1_1_1	257
173	GSL1_1_1	258
174	HWP1_2_1	261
175	HYR1_1_1	262
176	INT1a_1_1	263
177	KRE15f_1_1	264
178	KRE6_1_1	265
179	KRE9_1_1	266
180	MP65_1_1	269
181	PHR1_1_1	272
182	PHR2_1_1	273
183	PHR3_1_1	274
184	PRA1_1_1	275

n	Probe Name	SeqID
185	RBT1_1_1	277
186	RBT4_1_1	278
187	RHO1_1_1	279
188	RVS167_1_1	283
189	SKN1_1_1	285
190	TCA1_1_1	287
191	YAE1_1_1	289
192	CDR1_1_1	911
193	CDR1_2_1	912
194	CRD2_1_1	910
195	ERG11_1_1	917
196	FET3_1_1	914
197	FTR2_1_1	915
198	MDR1-7_1_1	916
199	MET3_1_1	913
200	SEC20_1_1	918
201	ADH1_1_1	248
202	ARG56_1_1	231
203	ESS1_1_1	253
204	GAP1_1_1	255
205	GNA1_1_1	256
206	HIS1_1_1	259
207	MLS1_1_1	268
208	NDE1_1_1	270
209	PFK2_1_1	271
210	SRB1_1_1	286
211	TRP1_1_1	288
212	YRB1_1_1	290
213	5triphosphatase_1_1	246
214	CCT8_1_1	235
215	CDC37_1_1	236
216	EDT1_1_1	251
217	ELF_1_1	252
218	FAL1_1_1	254
219	HTS1_1_1	260
220	MIG1_1_1	267
221	PRS1_1_1	276
222	RNR1_1_1	280
223	RPB7_1_1	281
224	RPL13_1_1	282
225	SHA3_1_1	284
226	YST1exon2_1_1	291
227	CCN1_1_1	292
228	CDC28_1_1	293
229	CLN2_1_1	294
230	CPH1_1_1	295

n	Probe Name	SeqID
231	CYB1_1_1	296
232	EFG1_1_1	297
233	MNT1_1_1	298
234	RBF1_1_1	299
235	RBF1_2_1	300
236	RIM101_1_1	301
237	RIM8_1_1	302
238	SEC14_1_1	303
239	SEC4_1_1	304
240	TUP1_1_1	305
241	YPT1_1_1	306
242	ZNF1CZF1_2_1	307
243	carO_1_1	2843
244	csuA_1_1	2854
245	csuA_B_1_1	2853
246	csuB_1_1	2852
247	csuC_1_1	2849
248	csuD_1_1	2848
249	dhbA_1_1	2845
250	dhbB_1_1	2846
251	gacS_1_1	2844
252	sid_1_1	2847
253	tnp-ACIBA_1_1	2850
254	waaA-ACIBA_1_1	2851
255	abc_1_1	2857
256	cysI_1_1	2860
257	dec_1_1	2859
258	furACIBA_1_1	2858
259	ompA-ACIBA_1_1	2863
260	por_1_1	2856
261	put1_1_1	2855
262	put3_1_1	2862
263	trpE_1_1	2861
264	asr_1_1	2876
265	ehuA_1_1	2885
266	ehuS_1_1	2878
267	ehuT_1_1	2883
268	ehuU_1_1	2882
269	ehuV_1_1	2879
270	lacZ_1_1	2877
271	ORF165_1_1	2881
272	ORF295_1_1	2884
273	ORF400_1_1	2886
274	slyA_1_1	2880
275	b1169_1_1	142
276	envZ_1_1	143

n	Probe Name	SeqID
277	fliCb_1_1	144
278	nfrB_1_1	145
279	nlpA_1_1	146
280	pilAe_1_1	147
281	yacH_1_1	148
282	yagX_1_1	149
283	ycdS_1_1	150
284	yciQ_1_1	151
285	ymcA_1_1	152
286	b1202_1_1	153
287	eae_1_1	154
288	eltB_1_1	155
289	escR_1_1	156
290	escT_1_1	157
291	escU_1_1	158
292	espB_1_1	159
293	fes_1_1	160
294	fes_2_1	161
295	fteA_1_1	162
296	hlyA_1_1	163
297	hlyB_1_1	164
298	iucA_1_1	165
299	iucB_1_1	166
300	iucC_1_1	167
301	papG_1_1	168
302	rfbE_1_1	169
303	shuA_1_1	170
304	SLTII_1_1	171
305	toxA-LTPA_1_1	172
306	VT2vaB_1_1	173
307	ABC-eltA_1_1	317
308	agrBfs_1_1	318
309	agrCfs_1_1	319
310	arcA_1_1	308
311	arcC_1_1	309
312	bkdA_1_1	310
313	cad_1_1	311
314	camE1_1_1	312
315	csrA_1_1	313
316	dacA_1_1	314
317	dfr_1_1	315
318	dhoD1a_1_1	316
319	dnaE_1_1	320
320	ebsA_1_1	321
321	ebsB_1_1	322
322	eep_1_1	323

n	Probe Name	SeqID
323	efaR_1_1	324
324	gls24_glsB_1_1	325
325	gph_1_1	326
326	gyrAEf_1_1	327
327	metEf_1_1	328
328	mntHCb2_1_1	329
329	mob2_1_1	330
330	mvaD_1_1	331
331	mvaE_1_1	332
332	parC_1_1	333
333	pcfG_1_1	334
334	phoZ_1_1	335
335	polC_1_1	336
336	ptb_1_1	337
337	recS1_1_1	338
338	rpoN_1_1	339
339	tms_1_1	340
340	tyrDC_1_1	341
341	tyrS_1_1	342
342	ace_1_1	351
343	asa1_1_1	343
344	asp1_1_1	344
345	cgh_1_1	345
346	cylA_1_1	346
347	cylB_1_1	347
348	cylI_1_1	348
349	cylL_cylS_1_1	349
350	cylM_1_1	350
351	ef00108_1_1	352
352	ef00109_1_1	353
353	ef0011_1_1	354
354	ef00113_1_1	355
355	ef0012_1_1	356
356	ef0022_1_1	357
357	ef0031_1_1	358
358	ef0032_1_1	359
359	ef0040_1_1	360
360	ef0058_1_1	361
361	enlA_1_1	362
362	esa_1_1	363
363	esp_1_1	364
364	gelE_1_1	365
365	groEL_1_1	366
366	groES_1_1	367
367	rt1_1_1	368
368	sala_1_1	369

n	Probe Name	SeqID
369	salb_1_1	370
370	sea1_1_1	371
371	sep1_1_1	372
372	vicK_1_1	373
373	yycH_1_1	374
374	yycI_1_1	375
375	yycJ_1_1	376
376	bglB_1_1	377
377	bglR_1_1	378
378	bglS_1_1	379
379	efmA_1_1	380
380	efmB_1_1	381
381	efmC_1_1	382
382	mreC_1_1	383
383	mreD_1_1	384
384	mvaDEfaecium_1_1	385
385	mvaEEfaecium_1_1	386
386	mvaK1Efaecium_1_1	387
387	mvaK2Efaecium_1_1	388
388	mvaSEfaecium_1_1	389
389	orf3_4Efaeciumb_1_1	390
390	orf6_7Efaecium_1_1	391
391	orf7_8Efaecium_1_1	392
392	orf9_10Efaecium_1_1	393
393	entA_entI_1_1	394
394	entD_1_1	395
395	entR_1_1	396
396	oep_1_1	397
397	sagA_1_2	398
398	H+ATPase_1_1	2887
399	cymA_1_1	449
400	cymD_1_1	450
401	cymE_1_1	451
402	cymH_1_1	452
403	cymI_1_1	453
404	cymJ_1_1	454
405	ddrA_1_1	455
406	fdt-1_1_1	456
407	fdt-2_1_1	457
408	fdt-3_1_1	458
409	gatY_1_1	459
410	hydH_1_1	460
411	masA_1_1	461
412	nasA_1_1	462
413	nasE_1_1	463
414	nasF_1_1	464

n	Probe Name	SeqID
415	pehX_1_1	465
416	pelX_1_1	466
417	tagH_1_1	467
418	tagK_1_1	468
419	tagT_1_1	469
420	acoA_1_1	408
421	acoB_1_1	409
422	acoC_1_1	410
423	ahlK_1_1	411
424	atsA_1_1	399
425	atsB_1_1	400
426	budC_1_1	401
427	citA_1_1	402
428	citW_1_1	403
429	citX_1_1	404
430	dalD_1_1	405
431	dalK_1_1	406
432	dalT_1_1	407
433	fimK_1_1	412
434	glfKPN2_1_1	413
435	liac_1_1	431
436	ltrA_1_1	414
437	mdcC_1_1	415
438	mdcF_1_1	416
439	mdcH_1_1	417
440	mrkA_1_1	418
441	mtrK_1_1	419
442	nifF_1_1	420
443	nifK_1_1	421
444	nifN_1_1	422
445	tyrP_1_1	423
446	ureA_1_1	424
447	wbbO_1_1	425
448	wza_1_1	426
449	wzb_1_1	427
450	wzmKPN2_1_1	428
451	wztKPN2_1_1	429
452	yojH_1_1	430
453	aldA_1_1	433
454	aldA_2_1	434
455	cim_1_1	432
456	hemly_1_1	435
457	pSL017_1_1	436
458	pSL020_1_1	437
459	rcaA_1_1	438
460	rmIC_1_1	439

n	Probe Name	SeqID
461	rmlD_1_1	440
462	waaG_1_1	441
463	wbbD_1_1	442
464	wbbM_1_1	443
465	wbbN_1_1	444
466	wbdA_1_1	445
467	wbdC_1_1	446
468	wztKpn_1_1	447
469	yibD_1_1	448
470	glpR_1_1	470
471	lasRb_1_1	471
472	OrfX_1_1	472
473	pa0260_1_1	473
474	pa0572_1_1	474
475	pa0625_1_1	475
476	pa0636_1_1	476
477	pa1046_1_1	477
478	pa1069_1_1	478
479	pa1846_1_1	479
480	pa3866_1_1	480
481	pa4082_1_1	481
482	pilAp_1_1	482
483	PilAp2_1_1	483
484	pilC_1_1	484
485	PstP_1_1	485
486	purK_1_1	486
487	uvrDII_1_1	487
488	vsml_1_1	488
489	vsmR_1_2	489
490	xcpX_1_1	490
491	algB_1_1	494
492	algN_1_1	495
493	algR_1_1	496
494	aprA_1_1	491
495	aprE_1_1	492
496	ctx_1_2	493
497	ExoS_1_1	497
498	fpvA_1_1	498
499	lasRa_1_1	499
500	lipA_1_1	500
501	lipH_1_1	501
502	Orf159_1_2	502
503	Orf252_1_1	503
504	pchG_1_1	504
505	PhzA_1_1	505
506	PhzB_1_1	506

n	Probe Name	SeqID
507	PLC_1_1	507
508	plcN_1_1	508
509	plcR_1_1	509
510	pvdD_1_1	510
511	pvdF_1_2	511
512	pyocinS1_1_1	512
513	pyocinS1im_1_1	513
514	pyocinS2_1_1	514
515	pys2_1_1	515
516	pys2_2_1	516
517	rbf303_1_1	517
518	rhIA_1_1	518
519	rhIB_1_1	519
520	rhIR_1_1	520
521	TnAP41_1_2	521
522	toxA_1_1	522
523	aad_1_1	711
524	atfA_1_1	706
525	atfB_1_1	707
526	atfC_1_1	708
527	ccmPrmi1_1_1	709
528	cyaPrmi_1_1	710
529	fifB_1_1	712
530	fifD_1_1	713
531	fifN_1_1	714
532	flhD_1_1	715
533	floA_1_1	716
534	ftsK_1_1	717
535	gstB_1_1	718
536	hemCPrmi_1_1	719
537	hemDPrmi_1_1	720
538	hev_1_1	721
539	katA_1_1	722
540	lpp1_1_1	723
541	menE_1_1	724
542	mfd_1_1	725
543	nrpA_1_1	726
544	nrpB_1_1	727
545	nrpG_1_1	728
546	nrpS_1_1	729
547	nrpT_1_1	730
548	nrpU_1_1	731
549	pat_1_1	732
550	pmfA_1_1	733
551	pmfC_1_1	734
552	pmfE_1_1	735

n	Probe Name	SeqID
553	ppaA_1_1	736
554	rsbA_1_1	737
555	rsbC_1_1	738
556	speB_1_1	739
557	stmA_1_1	740
558	stmB_1_1	741
559	terA_1_1	742
560	terD_1_1	743
561	umoA_1_1	744
562	umoB_1_1	745
563	umoC_1_1	746
564	ureR_1_1	747
565	xerC_1_1	748
566	ygbA_1_1	749
567	flaA_1_1	750
568	flaD_1_1	751
569	fliA_1_1	752
570	hpmA_1_1	753
571	hpmB_1_1	754
572	lpsPrmi_1_1	755
573	mrpA_1_1	756
574	mrpB_1_1	757
575	mrpC_1_1	758
576	mrpD_1_1	759
577	mrpE_1_1	760
578	mrpF_1_1	761
579	mrpG_1_1	762
580	mrpH_1_1	763
581	mrpI_1_1	764
582	mrpJ_1_1	765
583	patA_1_1	766
584	putA_1_1	767
585	uca_1_1	768
586	ureDPrmi_1_1	769
587	ureEPrmi_1_1	770
588	ureFPrmi_1_1	771
589	zapA_1_1	772
590	zapB_1_1	773
591	zapD_1_1	774
592	zapE_1_1	775
593	envZPrvu_1_1	776
594	frdC_1_1	777
595	frdD_1_1	778
596	infBPrvu_1_1	779
597	lad_1_1	780
598	tna2_1_1	781

n	Probe Name	SeqID
599	end_1_1	782
600	pqrA_1_1	783
601	urg_1_1	784
602	eD_2_1	2892
603	eE_1_1	2890
604	eF_1_1	2899
605	et_1_1	2898
606	ORF2-STEMA_1_1	2897
607	ORF4-STEMA_1_1	2896
608	pam_1_1	2895
609	pmp-STEMA_1_1	2894
610	ppi_1_1	2893
611	smeE_1_1	2889
612	smeF4494_1_1	2901
613	StmPr1_1_1	2891
614	StmPr2_1_1	2900
615	0487Straga_1_1	625
616	0488Straga_1_1	626
617	0493Straga_1_1	627
618	0495Straga_1_1	628
619	0498Straga_1_1	629
620	0500Straga_1_1	630
621	0502Straga_1_1	631
622	0504Straga_1_1	632
623	cpsA1Strgal_1_1	606
624	cpsB1Strgal_1_1	607
625	cpsC1Strgal_1_1	608
626	cpsD1Strgal_1_1	609
627	cpsE1Strgal_1_1	610
628	cpsG1Strgal_1_1	611
629	cpsIStrgal_1_1	612
630	cpsJStrgal_1_1	613
631	cpsKStrgal_1_1	614
632	cpsMStrgal_1_1	615
633	cpsYStragal_1_1	616
634	cpsYStragal_2_1	617
635	cylBStraga_1_1	618
636	cylEStraga_1_1	619
637	cylFStraga_1_1	620
638	cylHStraga_1_1	621
639	cylIStraga_1_1	622
640	cylJStraga_1_1	623
641	cylKStraga_1_1	624
642	folDStraga_1_1	633
643	neuA1Strgal_1_1	634
644	neuB1Strgal_1_1	635

n	Probe Name	SeqID
645	neuC1Strgal_1_1	636
646	neuD1Strgal_1_1	637
647	recNStraga_1_1	638
648	0499Straga_1_1	642
649	CAMPfactor_1_1	640
650	CAMPfactor_2_1	641
651	hylStragal_1_1	643
652	lipStragal_1_1	644
653	16SSStrepdysgal_1_1	2842
654	1760Strpneu_1_1	546
655	acyPStrpneu_1_1	547
656	cap1EStrpneu_1_1	523
657	cap1FStrpneu_1_1	524
658	cap1GStrpneu_1_1	525
659	cap3AStrpneu_1_1	526
660	cap3BStrpneu_1_1	527
661	celAStrpneu_1_1	528
662	celBStrpneu_1_1	529
663	cglAStrpneu_1_1	530
664	cglBStrpneu_1_1	531
665	cglCStrpneu_1_1	532
666	cglDStrpneu_1_1	533
667	cinA_1_1	534
668	cps14EStrpneum_1_1	535
669	cps14FStrpneum_1_1	536
670	cps14GStrpneum_1_1	537
671	cps14HStrpneum_1_1	538
672	cps19aHStrpneum_1_1	539
673	cps19aIStrpneum_1_1	540
674	cps19aKStrpneum_1_1	541
675	cps19fGStrpneum_1_1	542
676	cps23fGStrpneum_1_1	543
677	dexB_1_1	544
678	dinF_1_1	545
679	endAStrpneu_1_1	548
680	exoAStrpneu_1_1	549
681	exp72_1_1	550
682	fnlAStrpneu_1_1	551
683	fnlBStrpneu_1_1	552
684	fnlCStrpneu_1_1	553
685	gct18Strpneum_1_1	554
686	hexB1_1_1	555
687	hftsHStrpneu_1_1	556
688	immunofrag1Strpneu_1_1	557
689	immunofrag2Strpneu_2_1	558
690	immunofrag3Strpneu_2_1	559

n	Probe Name	SeqID
691	kdtBStrpneu_1_1	560
692	lysAStrpneu_1_1	561
693	pcpBStrpneu_1_1	562
694	pflCStrpneu_1_1	563
695	plpA_1_1	564
696	prtA1Strpneu_1_1	565
697	pspC1Strpneu_1_1	566
698	pspC2_1_1	567
699	purRStrpneu_1_1	568
700	pyrDAStrpneum_1_1	569
701	SP0828Strpneu_1_1	570
702	SP0830Strpneu_1_1	571
703	SP0833Strpneu_1_1	572
704	SP0837_38Strpneu_1_1	573
705	SP0839Strpneu_1_1	574
706	ugdStrpneu_1_1	575
707	uncC_1_1	576
708	vicXStrpneu_1_1	577
709	wchA6bStrpneum_1_1	578
710	wci4Strpneum_1_1	579
711	wciK4Strpneum_1_1	580
712	wciL4Strpneum_1_1	581
713	wciN6bStrpneum_1_1	582
714	wciO6bStrpneum_1_1	583
715	wciP6bStrpneum_1_1	584
716	wciY18Strpneum_1_1	585
717	wzdbStrpneum_1_1	586
718	wze6bStrpneum_1_1	587
719	wzy18Strpneum_1_1	588
720	wzy4Strpneum_1_1	589
721	wzy6bStrpneum_1_1	590
722	xpt_1_1	591
723	igaStrpneu_1_1	592
724	lytA_1_1	593
725	nanA_1_1	594
726	nanBStrpneu_1_1	595
727	pcpCStrpneu_1_1	596
728	ply_1_1	597
729	prtAStrpneu_1_1	598
730	pspA_1_2	599
731	SP0834Strpneu_1_1	600
732	SP0834Strpneu_1_2	601
733	sphtraStrpneu_1_1	602
734	wciJStrpneu_1_1	603
735	wziyStrpneu_1_1	604
736	wzxStrpneu_1_1	605

n	Probe Name	SeqID
737	cyclStrpyog_1_1	645
738	fah_rph_hlo_Strpyog_1_1	646
739	int_1_1	647
740	int315.5_1_1	648
741	murEStrpyog_1_1	649
742	oppA_1_1	650
743	oppCStrpyog_1_1	651
744	oppD_1_1	652
745	SPy0382Strpyog_1_1	653
746	SPy0390Strpyog_1_1	654
747	SpyM3_1351_1_1	655
748	vicXStrpyog_1_1	656
749	DNaseIStrpyog_1_1	657
750	fba2Strpyog_1_1	658
751	fhuAStrpyog_1_1	659
752	fhuB1Strpyog_1_1	660
753	fhuDStrpyog_1_1	661
754	fhuGStrpyog_1_1	662
755	hylA_1_1	663
756	hylP_1_1	664
757	hylp2_1_1	665
758	oppB_1_1	666
759	ropB_1_1	667
760	scpAStrpyog_1_1	668
761	sloStrpyog_1_1	669
762	smez-4Strpyog_1_1	670
763	sof_1_1	671
764	sof_2_1	672
765	speA_1_1	673
766	speB2Strpyog_1_1	674
767	speCStrpyog_1_1	675
768	speJStrpyog_1_1	676
769	srtBStrpyog_1_1	677
770	srtCStrpyog_1_1	678
771	srtEStrpyog_1_1	679
772	srtFStrpyog_1_1	680
773	srtGStrpyog_1_1	681
774	srtIStrpyog_1_1	682
775	srtKStrpyog_1_1	683
776	srtRStrpyog_1_1	684
777	srtTStrpyog_1_1	685
778	vicKStrpyog_1_1	686
779	573Stprmut_1_1	687
780	580SStprmut_1_1	688
781	581_582SStprmut_1_1	689
782	584SStprmut_1_1	690

n	Probe Name	SeqID
783	dltAStrmut_1_1	691
784	dltBStrmut_1_1	692
785	dltCpx1Strmut_1_1	693
786	dltDStrmut_1_1	694
787	lichStrbov_1_1	695
788	lytRStprmut_1_1	696
789	lytSStprmut_1_1	697
790	pepQStrmut_1_1	698
791	pflCStrmut_1_1	699
792	recNStprmut_1_1	700
793	ytqBStrmut_1_1	701
794	hlyXStrmut_1_1	702
795	igaStrmitis_1_1	703
796	igaStrsanguis_1_1	704
797	perMStrmut_1_1	705
798	fasCAXStrdysg_1_1	2904
799	sloStrep_1_1	2905
800	cataSaur_1_1	1
801	cataSaur_1_2	2
802	clfA_1_1	3
803	clfB_1_1	4
804	coa_1_1	5
805	coa_1_2	6
806	coa_2_2	2903
807	coa_3_1	2902
808	epiP-bsaP_1_1	58
809	geh_1_1	59
810	gyrA_1_1	60
811	gyrB_1_1	61
812	hemB_1_1	62
813	hemC_1_1	63
814	hemD_1_1	64
815	hemN_1_1	65
816	hsdS_1_1	66
817	hsdS_2_1	67
818	lip_1_1	68
819	menC_1_1	69
820	murC_1_1	70
821	nuc_1_1	71
822	pdhD_1_1	72
823	rpoB_1_1	73
824	SAV0431_1_1	74
825	SAV0439_1_1	75
826	SAV0440_1_1	76
827	SAV0441_1_1	77
828	sigB_1_1	78

n	Probe Name	SeqID
829	spa_1_2	79
830	sstC_1_1	80
831	tag_1_1	81
832	tyrA_1_1	82
833	bsaE_1_1	100
834	bsaG_1_1	101
835	cap5h_1_1	102
836	cap5i_1_1	103
837	cap5j_1_1	104
838	cap5k_1_1	105
839	cap8H_1_1	106
840	cap8I_1_1	107
841	cap8J_1_1	108
842	cap8K_1_1	109
843	EDIN_1_1	113
844	eta_1_1	114
845	etb_1_1	115
846	hglA_1_1	116
847	hglA_2_1	117
848	hglB_1_1	118
849	hglC_2_1	119
850	hla_1_1	120
851	hlb_1_2	121
852	lukF_1_1	122
853	lukS_1_1	123
854	lukS_2_1	124
855	NAG_1_1	125
856	sak_1_1	126
857	sea_1_1	127
858	seb_1_1	128
859	sec1_1_1	129
860	seg_1_1	130
861	seh_1_1	131
862	sel_1_1	132
863	set15_1_1	133
864	set6_1_1	134
865	set7_1_1	135
866	set8_1_1	136
867	sprV8_1_1	137
868	tst_1_1	138
869	agrB_1_1	178
870	agrC_1_1	179
871	alphSE1368_1_1	180
872	ardeSE0106_1_1	174
873	ardeSE0107_1_1	175
874	aroiSE0105_1_1	176

n	Probe Name	SeqID
875	atlE_1_1	177
876	gad_1_1	181
877	glucSE1191_1_1	182
878	hsp10_1_1	183
879	icaA_1_1	184
880	icaB_1_1	185
881	mvaSSepid_1_1	186
882	nitreSE1972_1_1	187
883	nitreSE1974_1_1	188
884	nitreSE1975_1_1	189
885	oiamtSE1209_1_1	190
886	ORF1Sepid_1_1	191
887	ORF3bSepid_1_1	192
888	qacR_1_1	193
889	sin_1_1	194
890	ureSE1861_1_1	195
891	ureSE1863_1_1	196
892	ureSE1864_1_1	197
893	ureSE1865_1_1	198
894	ureSE1867_1_1	199
895	gcaD_1_1	200
896	hld_orf5_1_1	201
897	icaC_1_1	202
898	icaD_1_1	203
899	icaR_1_1	204
900	psm_beta1and2_1_1	205
901	purR_1_1	206
902	spoVG_1_1	207
903	yabJ_1_1	208
904	folQShaemolyt_1_1	209
905	mvaCShaemolyticus_1_1	210
906	mvaDShaemolyt_1_1	211
907	mvaK1Shaemolyticus_1_1	212
908	mvaSShaemolyticus_1_1	213
909	RNApolsigm_1_1	214
910	lipShaemolyt_1_1	215
911	ydhK_1_1	2906
912	agrB2Stalugd_1_1	216
913	agrC2Stalugd_1_1	217
914	agrCStalugd_1_1	218
915	slamStalugd_1_1	219
916	fblStalugd_1_1	220
917	slushABCStalugd_1_1	221
918	RNApolsigmSsapro_1_1	222
919	RNApolsigmSsapro_1_2	223
920	msrw1Stwar_1_1	224

n	Probe Name	SeqID
921	nukMStwar_1_1	225
922	proDStwar_1_1	226
923	proMStwar_1_1	227
924	sigrpoStwar_1_1	228
925	tnpStwar_1_1	229
926	gehAStwar_1_1	230
927	0135mihck_1_1	945
928	0270cap_1_1	947
929	FAN_1_1	946
930	p53_1_1	944

All genes were selected from the literature and databases, compared by BLAST analysis to all other sequences available in the NCBI database. Primers were designed to amplify gene segments of 200 to 800 bp length devoid of apparent homology with genes of other bacterial species and *Homo sapiens*. Gene segments were amplified by using the puReTaq Ready-To-Go PCR beads (Amersham Biosciences, Freiburg, Germany) and cloned into the pDrive Cloning Vector (Qiagen, Hilden, Germany) according to the recommendations of the suppliers and transformed into competent *Escherichia coli* (XL-1-Blue) cells using the calcium chloride protocol (Sambrook, J. and Russell, D.W. 2001. Molecular cloning: a laboratory manual, 3rd ed. Cold Spring Harbor Laboratory Press, New York, N.Y).

For quality control purposes, all gene probes were partially sequenced and verified (with the BigDye kit 1.1 and an 377 DNA sequencer; Applied Biosystems, Foster City, USA). All sequences obtained were identical or substantially identical (>90% sequence identity) to those obtained from the database.

For DNA-probe production 930 recombinant plasmids containing the 930 selected gene segments were used for re-amplification. Amplicons were purified and spotted in 4 replicates per slide on UltraGAPS™ Coated Slides (gamma amino propyl silane coated slides, Corning, NY, USA). Approximately 1 nl DNA (with a concentration of about 0.1 to about 0.2 ng/nl) per spot was spotted onto the slide with a Biorobitics Microgrid Microarrayer (Genomic Solutions, Ann Arbor, MI, USA).

Example 2.5: Hybridization and scanning

All experiments described represent dual co-hybridizations of two different target DNA samples labelled respectively with Cy3 or Cy5. After removal of unbound label, Cy3 and Cy5 labelled DNAs were pooled and mixed with 10 µg of Salmon Sperm

DNA and 50 µg of poly-A-DNA. The mixture was frozen in liquid nitrogen and lyophilized in the dark. Prior to hybridization the target DNA was reconstituted in 110 µl hybridization solution (30% formamide, 0.1% SDS, 5xSSC) and denatured by heating at 95°C for 3 min prior to hybridization. Hybridization was automatically performed with a TECAN Hybridization Station (HS400, TECAN, Salzburg, Austria). The arrays were prewashed at 42°C for 1 min with 5x SSC and prehybridized in 110 µl denatured prehybridization buffer (30% formamide, 0.1% SDS, 5xSSC, 10mg/ml BSA) for 30 min at 42°C at mild agitation. After injection of 110 µl labelled DNA, hybridization was performed at 60°C for 18 hours at medium agitation. The arrays were washed at 42°C in wash buffer I (1x SSC, 0.1% SDS) - three cycles of 30 sec wash time and 2 min soak time -, in wash buffer II (0.1x SSC, 0.1% SDS) - five cycles of 30 sec wash time and 2 min soak time - and wash buffer III (0.1x SSC) - four cycles of 30 sec wash time and 2 min soak time - and finally dried at 30°C with N₂ (2.7 bar) for 3 min. Hybridized arrays were scanned with GenPix Personal Axon 4100A laser scanner (Axon Instruments, Union City, CA, USA). Laser light of wavelengths at 532 and 635 nm was used to excite Cy3 dye and Cy5 dye, respectively. Fluorescent images were analyzed by the GenePix Pro 6.0 and Acuity 4.0 software (Axon Instruments). For each feature (gene probe) the median pixel intensity of wavelength 635 nm or 532 nm, respectively, was determined and the median background of the respective wavelength subtracted (F635 Median – B635 and F532 Median – B532, respectively).

Example 2.6: Specificity

In order to allow the simultaneous and rapid identification, differentiation and characterisation of pathogens causing sepsis, a microarray comprising a set of 930 gene probes of 200 to 800 bp length was developed (Tab. 7). The clinically most relevant sepsis causing pathogens were represented on the microarray by gene probes specific for the genera and species *E. coli* (31), *Staphylococcus aureus* (69) and coagulase negative staphylococci (58), *P. aeruginosa* (53), *Streptococcus* spp. (185), *Enterococcus* spp.(92), *Proteus* spp. (79), *Klebsiella* spp.(71), *Enterobacter* spp. (11), *Stenotrophomonas maltophilia* (13), *Acinetobacter baumannii* (21) and *Candida albicans* (86). To allow for parallel detection of antibiotic resistance determinants, the array contained 131 bacterial resistance gene probes.

To facilitate the optimization, validation and standardization of microarray analysis, a set of 29 control probes was included. Different 16S rRNA gene probes (18) served as positive hybridization controls for bacterial DNA. The gene probe *rbcl_1_2* (segment of the rubisco gene of *Hordeum vulgare*) was prelabelled with Cy3 and Cy5 and spotted onto each subarray for visualisation of the array orientation. Gene probes derived from *Mus musculus* (2), *Dictyostelium discoideum* (2), *Homo sapiens* (5), *Hordeum vulgare* (1) were included as negative or positive hybridization controls. In all assays, one to five PCR-amplified DNA-segments, which had been added to each DNA preparation as a positive control, hybridized with the corresponding probes, indicating that labelling and hybridization had performed efficiently.

The specificity of the DNA-chip was validated with 44 well characterized clinical isolates and reference strains of the target species (40) as well as other related bacteria (4) (Table 8).

Tab. 8: Microorganism strains used for microarray validation. Non-target species are Nos 21, 25, 27 and 30.

No	Species	Strain	Dye
1	<i>A. baumannii</i>	DSM 30008	Cy5
2	<i>A. baumannii</i>	5256-2	Cy3
3	<i>P. aeruginosa</i>	ATCC 27853	Cy3
4	<i>E. coli</i>	CIP 105893	Cy3
5	<i>E. coli</i>	ATCC 25922	Cy5
6	<i>E. coli</i>	CIP 81.88	Cy3
7	<i>E. coli</i>	CIP 74.14	Cy5
8	<i>E. coli</i>	U10338-1	Cy5
9	<i>E. coli</i>	U10164-2	Cy5
10	<i>E. coli</i>	U10248-1	Cy5
11	<i>K. oxytoca</i>	DSM 4798	Cy5
12	<i>K. oxytoca</i>	U10274	Cy5
13	<i>K. pneumoniae</i>	DSM 681	Cy3
14	<i>K. pneumoniae</i>	O3-390	Cy3
15	<i>K. pneumoniae</i>	O8-889	Cy3
16	<i>P. mirabilis</i>	DSM 788	Cy5
17	<i>P. mirabilis</i>	U10515	Cy5

18	<i>P. mirabilis</i>	U9979-1	Cy5
19	<i>P. vulgaris</i>	DSM 2140	Cy5
20	<i>C. albicans</i>	ATCC 10231	Cy3
21	<i>E. casseliflavus</i>	UW703/95	Cy5
22	<i>E. faecalis</i>	ATCC 29212	Cy5
23	<i>E. faecalis</i>	UW700/95	Cy5
24	<i>E. faecium</i>	VRE 9182	Cy3
25	<i>E. gallinarum</i>	UW701/97	Cy3
26	<i>S. agalactiae</i>	DSM 2134	Cy5
27	<i>S. angiosus</i>	DSM 20563	Cy3
28	<i>S. bovis</i>	DSM 20480	Cy3
29	<i>S. dysgalactiae</i>	DSM 20662	Cy3
30	<i>S. gordonii</i>	DSM 6777	Cy5
31	<i>S. mutans</i>	DSM 20523	Cy3
32	<i>S. pneumoniae</i>	ATCC 49619	Cy3
33	<i>S. pyogenes</i>	DSM 11723	Cy3
34	<i>S. aureus</i>	ATCC 29213	Cy3
35	<i>S. aureus</i>	P2716	Cy3
36	<i>S. aureus</i>	C5010	Cy3
37	<i>S. aureus</i>	MW2	Cy3
38	<i>S. epidermidis</i>	ATCC 12228	Cy5
39	<i>S. epidermidis</i>	BC 1920	Cy5
40	<i>S. haemolyticus</i>	DSM 20263	Cy5
41	<i>S. hominis</i>	DSM 20228	Cy5
42	<i>S. lugdunensis</i>	DSM 4804	CY3
43	<i>S. saprophyticus</i>	ATCC 14953	Cy3
44	<i>S. warneri</i>	DSM 20316	Cy5

Hybridization experiments with DNA obtained from the respective target strains revealed hybridization profiles specific for the different species and genera (Fig. 7). In contrast, non-target organisms hybridized nearly exclusively with 16S rRNA (Probe Nos. 1-24) and antibiotic gene probes (Probe Nos. 26-156) (Fig. 7 panels G and H).

Example 2.7: Specificity of hybridization profiles for fungi

DNA of the fungus *Candida albicans* hybridized specifically with the *Candida* gene probes (Probe Nos. 157-242) including *Candida* resistance probes but not with bacterial 16 rRNA or species specific probes (Fig. 8, panel A). The specificity of two selected *Candida* probes is demonstrated in Fig. 8 panel B, the probes *ALS1* and *ASL43f* hybridized only with DNA obtained from *C. albicans* and not with any DNA obtained from the 43 bacterial strains.

Example 2.8: Specificity of hybridization profiles for Gram-negative bacteria

Strains of the genus *Klebsiella* showed specific hybridization with the *Klebsiella* gene probes (Probe Nos. 399-469). For this genus cross hybridization with lower intensity of the fluorescent signals was observed with some *E. coli* and *P. aeruginosa* probes (Nos. 275-306 and 470-522, respectively). This is also the case for bacterial strains of the genus *Proteus*, which show major hybridization with the *Proteus* gene probes allowing unambiguous identification (Probe Nos. 523-601). Vice versa, *P. aeruginosa* and *E. coli* can be easily identified by their hybridization profiles, but show minor cross hybridization with gene probes of *Klebsiella*, *E. coli* and *P. aeruginosa*, respectively. The *E. coli* reference strain CIP 105893 and the clinical isolate U10164-2 show nearly identical hybridization profiles, demonstrating the high reproducibility of the assay. Strains of the non-fermenting Gram-negative bacterium *A. baumannii* were readily identified based on their microarray hybridization profile showing specific hybridization to the *A. baumannii* gene probes (Nos. 243-263). The specificity of selected species specific probes is shown in Figure 9. The *A. baumannii* probe *csuA* hybridized only with labelled DNA preparations derived from *A. baumannii* strain DSM 30008 and the clinical *A. baumannii* isolate but not with any other of the 42 strains. The *P. aeruginosa* probe *PhzA* showed hybridization signals with a high intensity >60000 (Median fluorescence – background) only with DNA of the *P. aeruginosa* reference strain but with no other pathogen, demonstrating that although some *P. aeruginosa* probes (eg. *aprA*) show cross-hybridization with other Gram-negative species, unambiguous identification is feasible. Equally specific results were obtained with the *E. coli* probe *shuA*, which showed significant hybridization signals > 40000 only with DNA of the seven *E. coli* reference strains and clinical isolates. The closely related species *K. oxytoca* and *K. pneumoniae* were easily identified and discriminated from each other by the *K. oxytoca* probe *tagK* and the *K. pneumoniae*

probe *acoC*. The *P. mirabilis* probe *hpmB* was highly specific for the three *P. mirabilis* strains and isolates, while probe *enzZPrvu* was specific for *P. vulgaris*.

Example 2.9: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Enterococcus*

The microarray assay was highly specific in the identification of Gram-positive target species. Clinical isolates of the species *E. faecalis* and *E. faecium* could be identified and discriminated unambiguously by their hybridization profiles (Probe Nos. 307-375 and 376-398, respectively) (Fig. 7, panels E and F). The vancomycin resistant non-target strain *E. casseliflavus* (Fig. 7, panel G) showed hybridization to the bacterial 16S rRNA probes, the antibiotic resistance gene probes *vanC-2* (vancomycin resistance), *arr2* (Rifampin resistance) and *tetM* (tetracycline resistance) and the *S. aureus* probes *gyrA* (DNA gyrase subunit A), *rpoB* (RNA polymerase B subunit) and *sstC* (iron transport protein) only. This profile does not permit species identification but indicates a vancomycin resistant bacterium. A similar profile was obtained for the vancomycin resistant non-target strain *E. gallinarum* (not shown).

Example 2.10: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Streptococcus*

Microarray hybridization assays performed with streptococcal DNA obtained from reference strains of *S. pneumoniae*, *S. pyogenes*, *S. mutans* and *S. agalactiae* revealed species specific hybridization profiles and an excellent identification and discrimination of these target organisms (Fig. 7). The species *S. dysgalactiae* and *S. bovis* (*S. viridans* group) are each represented by a single gene probe on the array (*fasCAXStrdysg* and *lichStrbov*, respectively). These probes however exhibited specific hybridization to the target DNA only, and in this way permitted identification of the two species. Additionally both species showed hybridization with the 16S rRNA gene probes and *pbp2b* (penicillin binding protein of *S. pneumoniae*). Furthermore, *S. dysgalactiae* DNA hybridized with the probes *dacCStrpyog* and *murEStrpyog* and *S. bovis* DNA with *gyrA*, *rpoB* and *sstC* as *E. casseliflavus*. The non-target species *S. gordonii* and *S. angiosus* were readily discriminated by their hybridization profiles from other streptococci, *S. gordonii*

showed hybridization to the 16S rRNA genes only, *S. angiosus* DNA hybridized additionally to *gyrB* and *rpoB* (Fig. 7 H).

Example 2.11: Specificity of hybridization profiles for Gram-positive bacteria of the genus *Staphylococcus*

Hybridization assays performed with *S. aureus* strains and *S. epidermidis* DNA produced very specific hybridization profiles with little cross hybridization (Fig. 7 AB). The specificity of selected probes for coagulase-negative staphylococci is shown in Fig. 10. *S. saprophyticus*, *S. haemolyticus*, *S. lugdunensis*, *S. warneri* and *S. hominis* produced hybridization profiles distinct of those from *S. aureus* and *S. epidermidis*. For these species the following species specific probes were detected: *RNAposigmSsapro_1* and *_2* for *S. saprophyticus*, *RNApolisigm* and *mvaDShaemolyt* for *S. haemolyticus*, *agrCStalugd*, *slamStalugd* and *fbIStalug* for *S. lugdunensis* and *proDStwar*, *gehASTwar* and *msrw1Stwar* for *S. warneri*. For *S. hominis* no probe proved to be species specific. The *S. hominis* derived probe *ydHK* cross hybridized with DNA of *S. hominis*, *S. epidermidis* and *S. haemolyticus*. However, certain probe patterns seem to be species specific for *S. hominis* and may allow identification and discrimination from *S. haemolyticus* and other CoNS (eg. hybridization of *ydHK*, *tnpStwar* and *sin* and absence of *mvaDShaemolyt* and *RNApolisigm*).

Example 2.12: Detection of antibiotic resistance determinants in Gram-negative bacteria

Susceptibility results determined by the VITEK2 system were compared to the results of the microarray hybridization assay for the simultaneous detection of antibiotic resistance genes.

For the Gram-negative enterobacteria *E. coli*, *K. pneumoniae*, *K. oxytoca*, *P. mirabilis* and *P. vulgaris* there was a 100% correlation between phenotypic resistance to aminoglycosides (Gentamycin, Tobramycin) and hybridization to at least one of the aminoglycoside gene probes *aacA4*, *aacC2*, *aadA*, *aacA* and *_aphDStwar* (Table 9).

Tab. 9: Aminoglycoside resistance of Gram-negative enterobacteria:

Strain	Aminoglycoside	Aminoglycoside
--------	----------------	----------------

	resistance phenotype ^a	resistance gene
<i>E. coli</i> CIP 105893	GENi, TOB	aacA4, aadA
<i>E. coli</i> ATCC 25922	susceptible	-
<i>E. coli</i> CIP 81.88	susceptible	-
<i>E. coli</i> CIP 74.14	STR	-
<i>E. coli</i> U10338-1	GENi, TOB	aacA4
<i>E. coli</i> U10164-2	GEN, TOB	aacC2
<i>E. coli</i> U10248-1	GEN, TOB	aacC2, strB
<i>K. oxytoca</i> DSM 4798	susceptible	-
<i>K. oxytoca</i> U10274	susceptible	-
<i>K. pneumoniae</i> DSM 681	susceptible	-
<i>K. pneumoniae</i> 390	susceptible	-
<i>K. pneumoniae</i> 889	susceptible	strB
<i>P. mirabilis</i> DSM 788	susceptible	-
<i>P. mirabilis</i> U10515	susceptible	aacC1
<i>P. mirabilis</i> U9979-1	GEN, TOB	aacC2, aadA, aacA_aphDStwar, strB
<i>P. vulgaris</i> DSM 2140	susceptible	-

^aGEN Gentamycin; TOB tobramycin; STR Streptomycin, resistance was not tested routinely; i, intermediary resistance

All enterobacterial strains which showed resistance to β -lactam antibiotics (penicillin and cephalosporines) hybridized with at least one or more β -lactamase gene probes (*bla*CTX-M, *bla*FOX-3 and -6, *bla*PRMI, *bla*TEM, *bla*SHV, *bla*OXY-KLOX, *bla*A) (Table 10). There was no hybridization with the resistance gene probes *ampC* and *bla*OXA with any of the tested strains.

10 Tab. 10: β -lactam resistance of Gram-negative enterobacteria:

Strain	β -lactam resistance phenotype ^a	β -lactamase genotype ^b
<i>E. coli</i> CIP 105893	ESBL	blaCTX-M-22, blaFOX-3, blaFOX-6, blaPRMI, blaTEM
<i>E. coli</i> ATCC 25922	susceptible	-
<i>E. coli</i> CIP 81.88	susceptible	-
<i>E. coli</i> CIP 74.14	susceptible	-
<i>E. coli</i> U10338-1	ESBL	blaCTX-M-22, blaTEM

<i>E. coli</i> U10164-2	ESBL	blaCTX-M-22, blaOXY, blaPRMI, blaTEM
<i>E. coli</i> U10248-1	AMP, ASU, MEZ, PRLi, TZPi, CXM	blaCTX-M-22, blaPRMI, blaSHV, blaTEM
<i>K. oxytoca</i> DSM 4798	AMP, ASUi, MEZi	blaOXY
<i>K. oxytoca</i> U10274	ESBL	blaCTX-M-22, blaOXY, blaOXY- KLOX, blaSHV
<i>K. pneumoniae</i> DSM 681	AMP, ASUi, MEZi, PRLi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaSHV
<i>K. pneumoniae</i> 390	AMP, ASUi, MEZi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaOXY- KLOX, blaSHV
<i>K. pneumoniae</i> 889	AMPi	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY-KLOX, blaSHV
<i>P. mirabilis</i> DSM 788	KZi, CXMi, IMP	-
<i>P. mirabilis</i> U10515	ESBL, IMP	blaCTX-M-22,
<i>P. mirabilis</i> U9979-1	ESBL, IMP	blaCTX-M-22, blaFOX-3, blaFOX-6, blaOXY, blaPRMI, blaTEM
<i>P. vulgaris</i> DSM 2140	AMP, KZ	blaA ^d

^aESBL extended spectrum β -lactamases; AMP, Ampicillin; ASU, Ampicillin/Sublactam; MEZ, Mezlocillin; PRL, Piperacillin; KZ, Cefazolin; CXM, Cefuroxim; IMP, Imipenem; i, intermediary resistance

^bFluorescence signals ≥ 10000 were considered positive.

5 ^cFluorescence < 10000 ; most fluorescence signals were < 30000 for the hybridization assay with *P. vulgaris* DMS 2140

10 Strains susceptible to β -lactam antibiotics did not show significant hybridization signals (Median fluorescence – background < 10000) with any of the β -lactamase gene probes. Although the hybridization pattern permitted the detection of different types of β -lactamases (*blaTEM*, *blaSHV*, *blaCTX-M*, *blaFOX*), it did, however, not allow the detection and discrimination of extended spectrum β -lactamases (ESBL). For the two clinical isolates of *P. mirabilis* the ESBL phenotype was correlated with hybridization of the *acrA*, *-B* and *-R* genes, which encode a multidrug efflux pump.

15 Furthermore, for these two species, resistance to tetracycline was correlated with hybridization of the *P. mirabilis* derived gene probe *tetA_J*.

Example 2.13: Detection of antibiotic resistance determinants in Gram-positive bacteria

The phenotypic vancomycin resistance of the tested enterococci correlated by 100% with the genotypic resistance determined by microarray hybridization (Table 11).

Tab. 11: Phenotypic and genotypic resistance of *Enterococcus* strains.

Strain	Resistance phenotype ^a	Resistance genotype				
		Aminoglycosides	Glycopeptides	Macrolides	Tetracycline	Efflux pumps
<i>E. casseliflavus</i> UW703/95	VAN, DA, QDi	-	<i>vanC</i>	-	<i>tetM</i>	-
<i>E. faecalis</i> ATCC 29212	DA, Ei, QD, TET, SXT	-	-	-	<i>tetM</i>	<i>emeA</i>
<i>E. faecalis</i> UW700/95	VAN, DA, E, GEN, QD, STR, SXT	<i>aacA-aphD</i>	<i>vanB</i>	<i>ermB</i>	-	<i>emeA</i> ^b
<i>E. faecium</i> VRE9182	VAN, AMPi, DA, E, QDi, STR, Teicoplanin, TET	<i>aphA3</i> ^b	<i>vanA, vanB</i>	<i>ermB</i>	<i>tetL, tetM</i>	<i>msrCb</i>
<i>E. gallinarum</i> UW701/97	VAN, DA, QDi, SXT, TET	-	<i>vanC</i>	-	<i>tetM</i>	-

^aVAN, vancomycin; DA, clindamycin; E, erythromycin; QD, quinupristin/dalfopristin (streptogramins); STR, streptomycin, TET, tetracycline; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Hybridization to the *vanC*-2 gene was observed for the two vancomycin resistant strains *E. casseliflavus* and *E. gallinarum*, which contain the *vanC*-2 and the *vanC*-1 gene, respectively. The *vanB* gene was detected in the clinical isolates of *E. faecalis* UW700/95 and *E. faecium* VRE9182, the latter strain also hybridized with the *vanA* gene, indicating the presence of both genes. Furthermore, these two strains showed hybridization with aminoglycoside resistance genes (*aacA-aphD* and *aphA3*, respectively) and the macrolide resistance gene *ermB* (Table 11). The presence of efflux pumps involved in macrolide resistance was indicated by microarray hybridization for both *E. faecalis* strains (*emeA*) and *E. faecium* VRE9182 (*msrCb*).

Genotypic resistance to tetracycline was detected for four of the five strains (hybridization to *tetL* and/or *tetM*).

The tested streptococci showed phenotypic susceptibility to all tested antibiotics.

- 5 For staphylococci, there was 100% correlation between phenotypic resistance to penicillin and hybridization of the *blaZ* and the *blaIShaemolyt* gene probes and between oxacillin resistance and hybridization to the *mecA* gene (Table 12).

Tab. 12: Phenotypic and genotypic resistance of *Staphylococcus* strains.

Strain	Resistance phenotype ^a	Resistance genotype			
		Aminoglycosides	β-lactams	Macrolides	Efflux pumps
<i>S. aureus</i> ATCC 29213	PEN	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> P2116	PEN, Ei, DAi,	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> C5010	TOB, PEN, OXA, E, DA	<i>aadD</i>	<i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i>	<i>ermA</i>	<i>msrA</i> , <i>mreA</i>
<i>S. aureus</i> MW2	PEN, OXA, Trimethoprim	-		-	<i>msrA</i> , <i>mreA</i>
<i>S. epidermidis</i> ATCC 12228	PEN	-	<i>blaZ</i> , <i>blaIShaemolyt</i>	-	-
<i>S. epidermidis</i> BC1920	GEN, TOB, PEN, OXA, E, DA	<i>aadD</i> , <i>aacA-aphD</i> , <i>aacA_aphDStwar</i>	<i>blaZ</i> , <i>blaIShaemolyt</i> , <i>mecA</i>	<i>ermC</i>	-
<i>S. haemolyticus</i> DSM 20263	susceptible	-	-	-	-
<i>S. hominis</i> DSM 20228	susceptible	-	-	-	-
<i>S. lugdunensis</i> DSM 4804	susceptible	-	-	-	-
<i>S. saprophyticus</i> ATCC 14953	susceptible	-	-	-	-
<i>S. warneri</i> DSM 20316	susceptible	-	-	-	-

^aPEN, penicillin; OXA, oxacillin; DA, clindamycin; E, erythromycin; TOB, tobramycin; GEN, gentamicin; i, intermediary resistance.

^bRelative low fluorescence intensity (Median fluorescence – background <18.000).

Resistance to macrolides (erythromycin and clindamycin) was conferred by the *ermA* gene to the clinical MRSA isolate C5010 and by *ermC* to the MRSE isolate

BC1920. Both strains also showed resistance to tobramycin, which was conferred by the *aadD* gene, additionally the *S. epidermidis* isolate was resistant to gentamycin, due to possession of the *aacA-aphD* gene (Table 12). With the exception of the *S. epidermidis* strains, all CoNS showed a susceptible phenotype and did not hybridize with any of the resistance gene probes.

Example 2.14: Strain discrimination and detection of virulence genes in *S. aureus*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of four different *S. aureus* strains are listed in Table 13.

Tab. 13: Hybridization of *S. aureus* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000-20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000. Percentage of identity for gene probe sequences complementary to the genes present in the fully sequenced strain MW2 is given in the last column.

<i>S. aureus</i> virulence gene probes	<i>S. aureus</i> ATCC 29213	<i>S. aureus</i> P2116	MRSA C5010	MRSA MW2	Sequence identity with MW2 genome sequence
<i>epiP-bsaP</i>	-	-	-	+++	100%
<i>hsdS1</i>	+++	-	+++	-	Not present
<i>SAV0441</i>	+++	-	+++	+	Not present
<i>bsaE</i>	-	-	+	+++	100%
<i>bsaG</i>	++	++	+++	+++	100%
<i>cap5</i>	+++	-	+++	-	Not present
<i>cap8</i>	-	+++	-	+++	100%
<i>EDIN</i>	+++	-	-	-	Not present -
<i>lukF</i>	+	++	++	+++	95%
<i>lukS1</i>	+	+	++	+++	98%
<i>sea</i>	+++	-	+++	+++	100%
<i>sec1</i>	-	-	+	+++	98%
<i>seg1</i>	+++	-	+++	+	Not present

<i>seh</i>	-	+	++	+++	100%
<i>sel</i>	-	-	+	+++	99%

For other *S. aureus* gene probes the fluorescence intensities were either very low (MF-B <10000) for all four strains indicating the absence of the according gene (eg. *tst*, *eta* or *etb*) or very high (MF-B >50000), indicating the presence of the according gene in all four strains (eg. *hglA*, *hglB*, *hglC*, *NAG*, *sak*, *set*, *sprV8*). Capsular polysaccharides enhance microbial virulence by rendering the bacterium resistant to phagocytosis. Among the eleven capsular serotypes of *S. aureus*, serotypes 5 and 8 account for $\approx 25\%$ and 50% , respectively, of isolates recovered from humans. Moreover, these two serotypes, carrying the genes *cap5* and *cap8*, are prevalent among isolates from clinical infections as well as from commensal sources. By microarray hybridization the *cap5* gene was detected in the ATCC 29213 strain and the clinical MRSA isolate C5010, while *cap8* was detected in the clinical isolate P2116 and the community-acquired MRSA strain MW2 (Table 13). The latter strain hybridized to many virulence gene probes including the leukocidin gene probes *lukF* and *lukS* and the enterotoxin gene probes *sea*, *sec*, *seh* and *sel*. This microarray gene profile is in perfect concordance with genome sequence of this fully sequenced strain, which produces the Pantone-Valentine leukocidin (PVL), encoded by *lukF* and *lukS*. Pantone-Valentine leukocidin forms non-specific pores in leukocyte plasma membranes, which result in increased permeability and eventual host cell lysis. While strain MW2 does not harbor the gene *seg* encoding enterotoxin G, this gene was detected in the ATCC strain and the clinical MRSA isolate C5010, which both also showed hybridization with *sea* (Enterotoxin A). In contrast, the clinical isolate P2116 showed no or only minor hybridization with these virulence probes. From these results it can be concluded that microarray hybridization patterns allow the discrimination of different *S. aureus* strains as well as the detection of clinically relevant virulence determinants.

Example 2.15: Strain discrimination and detection of virulence genes in *E. coli*

Virulence gene probes, showing varying fluorescence intensities after hybridization with DNA of seven different *E. coli* strains are listed in Table 14.

Tab. 14: Hybridization of *E. coli* virulence gene probes: -, Median fluorescence <10000; +, Median fluorescence ≥10000 -20000; ++, Median fluorescence >20000-50000; +++, Median fluorescence <50000.

	<i>E. coli</i> CIP 105893 ESBL	<i>E. coli</i> ATCC 25922	<i>E. coli</i> CIP 81.88	<i>E. coli</i> CIP 74.14	<i>E. coli</i> U10338-1 ESBL	<i>E. coli</i> U10164-2 ESBL, GEN-R	<i>E. coli</i> U10248-1 GEN-R
<i>b1169</i>	+++	++	+++	++	+++	+++	-
<i>ycdS</i>	+++	++	+++	++	+++	+++	-
<i>ymcA</i>	+++	+	+++	-	-	+	+
<i>b1202</i>	+++	-	+++	-	-	-	+++
<i>fteA</i>	+	+	-	++	+++	+++	++
<i>iucA</i>	+	++	-	-	+++	+++	+++
<i>iucB</i>	-	++	-	-	++	+++	++
<i>iucC</i>	+	++	-	-	+++	+++	+++
<i>papG</i>	-	+++	-	++	-	-	+++

5

None of the listed genes was detected in all seven strains. Major hybridization of the *iuc* aerobactin synthesis genes was detected for four strains. The genes *fteA* (allele of *papA*) and *papG*, both involved in adhesion to host cells and virulence in urinary tract infections were detected in five strains. The three clinical isolates U10338-1, U10164-2 and U10248-1 were all isolated from patients with urinary tract infections. Based on the virulence hybridization pattern, strains U10338-1 and U10164-2 are nearly identical, while strain U10248-1 can be clearly discriminated.

10

Sequence Listing – Free text**a) Probe sequences**

SEQ ID NO	Probe name	Template source
1	cataSaur_1_1	<i>Staphylococcus aureus</i>
2	cataSaur_1_2	<i>Staphylococcus aureus</i>
3	clfA_1_1	<i>Staphylococcus aureus</i>
4	clfB_1_1	<i>Staphylococcus aureus</i>
5	coa_1_1	<i>Staphylococcus aureus</i>
6	coa_1_2	<i>Staphylococcus aureus</i>
7	I-clpC_1_1	<i>Staphylococcus aureus</i>
8	I-clpP_1_1	<i>Staphylococcus aureus</i>
9	I-ctaA_1_1	<i>Staphylococcus aureus</i>
10	I-ctsR_1_1	<i>Staphylococcus aureus</i>
11	I-dltA_1_1	<i>Staphylococcus aureus</i>
12	I-dltB_1_1	<i>Staphylococcus aureus</i>
13	I-dltC_1_1	<i>Staphylococcus aureus</i>
14	I-dnaK_1_1	<i>Staphylococcus aureus</i>
15	I-elkT_1_1	<i>Staphylococcus aureus</i>
16	I-femD_1_1	<i>Staphylococcus aureus</i>
17	I-glnA_1_1	<i>Staphylococcus aureus</i>
18	I-glnR_1_1	<i>Staphylococcus aureus</i>
19	I-grlA_1_1	<i>Staphylococcus aureus</i>
20	I-grlB_1_1	<i>Staphylococcus aureus</i>
21	I-groEL_1_1	<i>Staphylococcus aureus</i>
22	I-groES_1_1	<i>Staphylococcus aureus</i>
23	I-hemA_1_1	<i>Staphylococcus aureus</i>
24	I-hemE_1_1	<i>Staphylococcus aureus</i>
25	I-hemH_1_1	<i>Staphylococcus aureus</i>
26	I-hemL_1_1	<i>Staphylococcus aureus</i>
27	I-hemY_1_1	<i>Staphylococcus aureus</i>
28	I-lepA_1_1	<i>Staphylococcus aureus</i>
29	I-lrgA_1_1	<i>Staphylococcus aureus</i>
30	I-lrgB_1_1	<i>Staphylococcus aureus</i>
31	I-lytM_1_1	<i>Staphylococcus aureus</i>
32	I-menB_1_1	<i>Staphylococcus aureus</i>
33	I-menD_1_1	<i>Staphylococcus aureus</i>
34	I-menE_1_1	<i>Staphylococcus aureus</i>
35	I-menF_1_1	<i>Staphylococcus aureus</i>
36	I-mreB_1_1	<i>Staphylococcus aureus</i>
37	I-mreR_1_1	<i>Staphylococcus aureus</i>
38	I-mutL_1_1	<i>Staphylococcus aureus</i>
39	I-mutS_1_1	<i>Staphylococcus aureus</i>
40	I-NAG_1_1	<i>Staphylococcus aureus</i>
41	I-pbg_1_1	<i>Staphylococcus aureus</i>
42	I-pbpF_1_1	<i>Staphylococcus aureus</i>
43	I-pdhB_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
44	I-pdhC_1_1	<i>Staphylococcus aureus</i>
45	I-rsbU_1_1	<i>Staphylococcus aureus</i>
46	I-rsbV_1_1	<i>Staphylococcus aureus</i>
47	I-rsbW_1_1	<i>Staphylococcus aureus</i>
48	I-sgp_1_1	<i>Staphylococcus aureus</i>
49	I-sirR_1_1	<i>Staphylococcus aureus</i>
50	I-sodA_1_1	<i>Staphylococcus aureus</i>
51	I-sodB_1_1	<i>Staphylococcus aureus</i>
52	I-sstA_1_1	<i>Staphylococcus aureus</i>
53	I-sstB_1_1	<i>Staphylococcus aureus</i>
54	I-sstC_1_1	<i>Staphylococcus aureus</i>
55	I-sstD_1_1	<i>Staphylococcus aureus</i>
56	I-trx_1_1	<i>Staphylococcus aureus</i>
57	I-yhiN_1_1	<i>Staphylococcus aureus</i>
58	epiP-bsaP_1_1	<i>Staphylococcus aureus</i>
59	geh_1_1	<i>Staphylococcus aureus</i>
60	gyrA_1_1	<i>Staphylococcus aureus</i>
61	gyrB_1_1	<i>Staphylococcus aureus</i>
62	hemB_1_1	<i>Staphylococcus aureus</i>
63	hemC_1_1	<i>Staphylococcus aureus</i>
64	hemD_1_1	<i>Staphylococcus aureus</i>
65	hemN_1_1	<i>Staphylococcus aureus</i>
66	hsdS_1_1	<i>Staphylococcus aureus</i>
67	hsdS_2_1	<i>Staphylococcus aureus</i>
68	lip_1_1	<i>Staphylococcus aureus</i>
69	menC_1_1	<i>Staphylococcus aureus</i>
70	murC_1_1	<i>Staphylococcus aureus</i>
71	nuc_1_1	<i>Staphylococcus aureus</i>
72	pdhD_1_1	<i>Staphylococcus aureus</i>
73	rpoB_1_1	<i>Staphylococcus aureus</i>
74	SAV0431_1_1	<i>Staphylococcus aureus</i>
75	SAV0439_1_1	<i>Staphylococcus aureus</i>
76	SAV0440_1_1	<i>Staphylococcus aureus</i>
77	SAV0441_1_1	<i>Staphylococcus aureus</i>
78	sigB_1_1	<i>Staphylococcus aureus</i>
79	spa_1_2	<i>Staphylococcus aureus</i>
80	sstC_1_1	<i>Staphylococcus aureus</i>
81	tag_1_1	<i>Staphylococcus aureus</i>
82	tyrA_1_1	<i>Staphylococcus aureus</i>
83	I-aroC_1_1	<i>Staphylococcus aureus</i>
84	I-aroA_1_1	<i>Staphylococcus aureus</i>
85	I-cna_1_1	<i>Staphylococcus aureus</i>
86	I-ebpS_1_1	<i>Staphylococcus aureus</i>
87	I-eno_1_1	<i>Staphylococcus aureus</i>
88	I-fbpA_1_1	<i>Staphylococcus aureus</i>
89	I-fib_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
90	I-fnbB_1_1	<i>Staphylococcus aureus</i>
91	I-srtA_1_1	<i>Staphylococcus aureus</i>
92	I-stpC_1_1	<i>Staphylococcus aureus</i>
93	I-fnbA_1_1	<i>Staphylococcus aureus</i>
94	I-spa_1_1	<i>Staphylococcus aureus</i>
95	I-aroE_1_1	<i>Staphylococcus aureus</i>
96	I-aroF_1_1	<i>Staphylococcus aureus</i>
97	I-aroG_1_1	<i>Staphylococcus aureus</i>
98	I-asp23_1_1	<i>Staphylococcus aureus</i>
99	I-atl_1_1	<i>Staphylococcus aureus</i>
100	bsaE_1_1	<i>Staphylococcus aureus</i>
101	bsaG_1_1	<i>Staphylococcus aureus</i>
102	cap5h_1_1	<i>Staphylococcus aureus</i>
103	cap5i_1_1	<i>Staphylococcus aureus</i>
104	cap5j_1_1	<i>Staphylococcus aureus</i>
105	cap5k_1_1	<i>Staphylococcus aureus</i>
106	cap8H_1_1	<i>Staphylococcus aureus</i>
107	cap8I_1_1	<i>Staphylococcus aureus</i>
108	cap8J_1_1	<i>Staphylococcus aureus</i>
109	cap8K_1_1	<i>Staphylococcus aureus</i>
110	I-hld_1_1	<i>Staphylococcus aureus</i>
111	I-hysA_1_1	<i>Staphylococcus aureus</i>
112	I-IgGbg_1_1	<i>Staphylococcus aureus</i>
113	EDIN_1_1	<i>Staphylococcus aureus</i>
114	eta_1_1	<i>Staphylococcus aureus</i>
115	etb_1_1	<i>Staphylococcus aureus</i>
116	hglA_1_1	<i>Staphylococcus aureus</i>
117	hglA_2_1	<i>Staphylococcus aureus</i>
118	hglB_1_1	<i>Staphylococcus aureus</i>
119	hglC_2_1	<i>Staphylococcus aureus</i>
120	hla_1_1	<i>Staphylococcus aureus</i>
121	hlb_1_2	<i>Staphylococcus aureus</i>
122	lukF_1_1	<i>Staphylococcus aureus</i>
123	lukS_1_1	<i>Staphylococcus aureus</i>
124	lukS_2_1	<i>Staphylococcus aureus</i>
125	NAG_1_1	<i>Staphylococcus aureus</i>
126	sak_1_1	<i>Staphylococcus aureus</i>
127	sea_1_1	<i>Staphylococcus aureus</i>
128	seb_1_1	<i>Staphylococcus aureus</i>
129	sec1_1_1	<i>Staphylococcus aureus</i>
130	seg_1_1	<i>Staphylococcus aureus</i>
131	seh_1_1	<i>Staphylococcus aureus</i>
132	sel_1_1	<i>Staphylococcus aureus</i>
133	set15_1_1	<i>Staphylococcus aureus</i>
134	set6_1_1	<i>Staphylococcus aureus</i>
135	set7_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
136	set8_1_1	<i>Staphylococcus aureus</i>
137	sprV8_1_1	<i>Staphylococcus aureus</i>
138	tst_1_1	<i>Staphylococcus aureus</i>
139	I-sdrC_1_1	<i>Staphylococcus aureus</i>
140	I-sdrD_1_1	<i>Staphylococcus aureus</i>
141	I-sdrE_1_1	<i>Staphylococcus aureus</i>
142	b1169_1_1	<i>Escherichia coli</i>
143	envZ_1_1	<i>Escherichia coli</i>
144	fliCb_1_1	<i>Escherichia coli</i>
145	nfrB_1_1	<i>Escherichia coli</i>
146	nlpA_1_1	<i>Escherichia coli</i>
147	pilAe_1_1	<i>Escherichia coli</i>
148	yacH_1_1	<i>Escherichia coli</i>
149	yagX_1_1	<i>Escherichia coli</i>
150	ycdS_1_1	<i>Escherichia coli</i>
151	yciQ_1_1	<i>Escherichia coli</i>
152	ymcA_1_1	<i>Escherichia coli</i>
153	b1202_1_1	<i>Escherichia coli</i>
154	eae_1_1	<i>Escherichia coli</i>
155	eltB_1_1	<i>Escherichia coli</i>
156	escR_1_1	<i>Escherichia coli</i>
157	escT_1_1	<i>Escherichia coli</i>
158	escU_1_1	<i>Escherichia coli</i>
159	espB_1_1	<i>Escherichia coli</i>
160	fes_1_1	<i>Escherichia coli</i>
161	fes_2_1	<i>Escherichia coli</i>
162	fteA_1_1	<i>Escherichia coli</i>
163	hlyA_1_1	<i>Escherichia coli</i>
164	hlyB_1_1	<i>Escherichia coli</i>
165	iucA_1_1	<i>Escherichia coli</i>
166	iucB_1_1	<i>Escherichia coli</i>
167	iucC_1_1	<i>Escherichia coli</i>
168	papG_1_1	<i>Escherichia coli</i>
169	rfbE_1_1	<i>Escherichia coli</i>
170	shuA_1_1	<i>Escherichia coli</i>
171	SLTII_1_1	<i>Escherichia coli</i>
172	toxA-LTPA_1_1	<i>Escherichia coli</i>
173	VT2vaB_1_1	<i>Escherichia coli</i>
174	ardeSE0106_1_1	<i>Staphylococcus epidermidis</i>
175	ardeSE0107_1_1	<i>Staphylococcus epidermidis</i>
176	aroiSE0105_1_1	<i>Staphylococcus epidermidis</i>
177	atIE_1_1	<i>Staphylococcus epidermidis</i>
178	agrB_1_1	<i>Staphylococcus epidermidis</i>
179	agrC_1_1	<i>Staphylococcus epidermidis</i>
180	alphSE1368_1_1	<i>Staphylococcus epidermidis</i>
181	gad_1_1	<i>Staphylococcus epidermidis</i>

SEQ ID NO	Probe name	Template source
182	glucSE1191_1_1	<i>Staphylococcus epidermidis</i>
183	hsp10_1_1	<i>Staphylococcus epidermidis</i>
184	icaA_1_1	<i>Staphylococcus epidermidis</i>
185	icaB_1_1	<i>Staphylococcus epidermidis</i>
186	mvaSSepid_1_1	<i>Staphylococcus epidermidis</i>
187	nitreSE1972_1_1	<i>Staphylococcus epidermidis</i>
188	nitreSE1974_1_1	<i>Staphylococcus epidermidis</i>
189	nitreSE1975_1_1	<i>Staphylococcus epidermidis</i>
190	oiamtSE1209_1_1	<i>Staphylococcus epidermidis</i>
191	ORF1Sepid_1_1	<i>Staphylococcus epidermidis</i>
192	ORF3bSepid_1_1	<i>Staphylococcus epidermidis</i>
193	qacR_1_1	<i>Staphylococcus epidermidis</i>
194	sin_1_1	<i>Staphylococcus epidermidis</i>
195	ureSE1861_1_1	<i>Staphylococcus epidermidis</i>
196	ureSE1863_1_1	<i>Staphylococcus epidermidis</i>
197	ureSE1864_1_1	<i>Staphylococcus epidermidis</i>
198	ureSE1865_1_1	<i>Staphylococcus epidermidis</i>
199	ureSE1867_1_1	<i>Staphylococcus epidermidis</i>
200	gcaD_1_1	<i>Staphylococcus epidermidis</i>
201	hld_orf5_1_1	<i>Staphylococcus epidermidis</i>
202	icaC_1_1	<i>Staphylococcus epidermidis</i>
203	icaD_1_1	<i>Staphylococcus epidermidis</i>
204	icaR_1_1	<i>Staphylococcus epidermidis</i>
205	psm_beta1and2_1_1	<i>Staphylococcus epidermidis</i>
206	purR_1_1	<i>Staphylococcus epidermidis</i>
207	spoVG_1_1	<i>Staphylococcus epidermidis</i>
208	yabJ_1_1	<i>Staphylococcus epidermidis</i>
209	folQShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
210	mvaCShaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
211	mvaDShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
212	mvaK1Shaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
213	mvaSShaemolyticus_1_1	<i>Staphylococcus haemolyticus</i>
214	RNApolsigm_1_1	<i>Staphylococcus haemolyticus</i>
215	lipShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
216	agrB2Stalugd_1_1	<i>Staphylococcus lugdunensis</i>
217	agrC2Stalugd_1_1	<i>Staphylococcus lugdunensis</i>
218	agrCStalugd_1_1	<i>Staphylococcus lugdunensis</i>
219	slamStalugd_1_1	<i>Staphylococcus lugdunensis</i>
220	fblStalugd_1_1	<i>Staphylococcus lugdunensis</i>
221	slushABCStalugd_1_1	<i>Staphylococcus lugdunensis</i>
222	RNApolsigmSsapro_1_1	<i>Staphylococcus saprophyticus</i>
223	RNApolsigmSsapro_1_2	<i>Staphylococcus saprophyticus</i>
224	msrw1Stwar_1_1	<i>Staphylococcus warneri</i>
225	nukMStwar_1_1	<i>Staphylococcus warneri</i>
226	proDStwar_1_1	<i>Staphylococcus warneri</i>
227	proMStwar_1_1	<i>Staphylococcus warneri</i>

SEQ ID NO	Probe name	Template source
228	sigrpoStwar_1_1	<i>Staphylococcus warneri</i>
229	tnpStwar_1_1	<i>Staphylococcus warneri</i>
230	gehASTwar_1_1	<i>Staphylococcus warneri</i>
231	ARG56_1_1	<i>Candida albicans</i>
232	ASL43f_1_1	<i>Candida albicans</i>
233	BGL2_1_1	<i>Candida albicans</i>
234	CACHS3_1_1	<i>Candida albicans</i>
235	CCT8_1_1	<i>Candida albicans</i>
236	CDC37_1_1	<i>Candida albicans</i>
237	CEF3_1_1	<i>Candida albicans</i>
238	CHS1_1_1	<i>Candida albicans</i>
239	CHS2_1_1	<i>Candida albicans</i>
240	CHS4_1_1	<i>Candida albicans</i>
241	CHS5_1_1	<i>Candida albicans</i>
242	CHT1_1_1	<i>Candida albicans</i>
243	CHT2_1_1	<i>Candida albicans</i>
244	CHT4_1_1	<i>Candida albicans</i>
245	CSA1_1_1	<i>Candida albicans</i>
246	5triphosphatase_1_1	<i>Candida albicans</i>
247	AAF1_1_1	<i>Candida albicans</i>
248	ADH1_1_1	<i>Candida albicans</i>
249	ALS1_1_1	<i>Candida albicans</i>
250	ALS7_1_1	<i>Candida albicans</i>
251	EDT1_1_1	<i>Candida albicans</i>
252	ELF_1_1	<i>Candida albicans</i>
253	ESS1_1_1	<i>Candida albicans</i>
254	FAL1_1_1	<i>Candida albicans</i>
255	GAP1_1_1	<i>Candida albicans</i>
256	GNA1_1_1	<i>Candida albicans</i>
257	GSC1_1_1	<i>Candida albicans</i>
258	GSL1_1_1	<i>Candida albicans</i>
259	HIS1_1_1	<i>Candida albicans</i>
260	HTS1_1_1	<i>Candida albicans</i>
261	HWP1_2_1	<i>Candida albicans</i>
262	HYR1_1_1	<i>Candida albicans</i>
263	INT1a_1_1	<i>Candida albicans</i>
264	KRE15f_1_1	<i>Candida albicans</i>
265	KRE6_1_1	<i>Candida albicans</i>
266	KRE9_1_1	<i>Candida albicans</i>
267	MIG1_1_1	<i>Candida albicans</i>
268	MLS1_1_1	<i>Candida albicans</i>
269	MP65_1_1	<i>Candida albicans</i>
270	NDE1_1_1	<i>Candida albicans</i>
271	PFK2_1_1	<i>Candida albicans</i>
272	PHR1_1_1	<i>Candida albicans</i>
273	PHR2_1_1	<i>Candida albicans</i>

SEQ ID NO	Probe name	Template source
274	PHR3_1_1	<i>Candida albicans</i>
275	PRA1_1_1	<i>Candida albicans</i>
276	PRS1_1_1	<i>Candida albicans</i>
277	RBT1_1_1	<i>Candida albicans</i>
278	RBT4_1_1	<i>Candida albicans</i>
279	RHO1_1_1	<i>Candida albicans</i>
280	RNR1_1_1	<i>Candida albicans</i>
281	RPB7_1_1	<i>Candida albicans</i>
282	RPL13_1_1	<i>Candida albicans</i>
283	RVS167_1_1	<i>Candida albicans</i>
284	SHA3_1_1	<i>Candida albicans</i>
285	SKN1_1_1	<i>Candida albicans</i>
286	SRB1_1_1	<i>Candida albicans</i>
287	TCA1_1_1	<i>Candida albicans</i>
288	TRP1_1_1	<i>Candida albicans</i>
289	YAE1_1_1	<i>Candida albicans</i>
290	YRB1_1_1	<i>Candida albicans</i>
291	YST1exon2_1_1	<i>Candida albicans</i>
292	CCN1_1_1	<i>Candida albicans</i>
293	CDC28_1_1	<i>Candida albicans</i>
294	CLN2_1_1	<i>Candida albicans</i>
295	CPH1_1_1	<i>Candida albicans</i>
296	CYB1_1_1	<i>Candida albicans</i>
297	EFG1_1_1	<i>Candida albicans</i>
298	MNT1_1_1	<i>Candida albicans</i>
299	RBF1_1_1	<i>Candida albicans</i>
300	RBF1_2_1	<i>Candida albicans</i>
301	RIM101_1_1	<i>Candida albicans</i>
302	RIM8_1_1	<i>Candida albicans</i>
303	SEC14_1_1	<i>Candida albicans</i>
304	SEC4_1_1	<i>Candida albicans</i>
305	TUP1_1_1	<i>Candida albicans</i>
306	YPT1_1_1	<i>Candida albicans</i>
307	ZNF1CZF1_2_1	<i>Candida albicans</i>
308	arcA_1_1	<i>Enterococcus faecalis</i>
309	arcC_1_1	<i>Enterococcus faecalis</i>
310	bkdA_1_1	<i>Enterococcus faecalis</i>
311	cad_1_1	<i>Enterococcus faecalis</i>
312	camE1_1_1	<i>Enterococcus faecalis</i>
313	csrA_1_1	<i>Enterococcus faecalis</i>
314	dacA_1_1	<i>Enterococcus faecalis</i>
315	dfr_1_1	<i>Enterococcus faecalis</i>
316	dhoD1a_1_1	<i>Enterococcus faecalis</i>
317	ABC-eltA_1_1	<i>Enterococcus faecalis</i>
318	agrBfs_1_1	<i>Enterococcus faecalis</i>
319	agrCfs_1_1	<i>Enterococcus faecalis</i>

SEQ ID NO	Probe name	Template source
320	dnaE_1_1	<i>Enterococcus faecalis</i>
321	ebsA_1_1	<i>Enterococcus faecalis</i>
322	ebsB_1_1	<i>Enterococcus faecalis</i>
323	eep_1_1	<i>Enterococcus faecalis</i>
324	efaR_1_1	<i>Enterococcus faecalis</i>
325	glS24_glsB_1_1	<i>Enterococcus faecalis</i>
326	gph_1_1	<i>Enterococcus faecalis</i>
327	gyrAEf_1_1	<i>Enterococcus faecalis</i>
328	metEf_1_1	<i>Enterococcus faecalis</i>
329	mntHCb2_1_1	<i>Enterococcus faecalis</i>
330	mob2_1_1	<i>Enterococcus faecalis</i>
331	mvaD_1_1	<i>Enterococcus faecalis</i>
332	mvaE_1_1	<i>Enterococcus faecalis</i>
333	parC_1_1	<i>Enterococcus faecalis</i>
334	pcfG_1_1	<i>Enterococcus faecalis</i>
335	phoZ_1_1	<i>Enterococcus faecalis</i>
336	polC_1_1	<i>Enterococcus faecalis</i>
337	ptb_1_1	<i>Enterococcus faecalis</i>
338	recS1_1_1	<i>Enterococcus faecalis</i>
339	rpoN_1_1	<i>Enterococcus faecalis</i>
340	tms_1_1	<i>Enterococcus faecalis</i>
341	tyrDC_1_1	<i>Enterococcus faecalis</i>
342	tyrS_1_1	<i>Enterococcus faecalis</i>
343	asa1_1_1	<i>Enterococcus faecalis</i>
344	asp1_1_1	<i>Enterococcus faecalis</i>
345	cgh_1_1	<i>Enterococcus faecalis</i>
346	cylA_1_1	<i>Enterococcus faecalis</i>
347	cylB_1_1	<i>Enterococcus faecalis</i>
348	cylI_1_1	<i>Enterococcus faecalis</i>
349	cylL_cylS_1_1	<i>Enterococcus faecalis</i>
350	cylM_1_1	<i>Enterococcus faecalis</i>
351	ace_1_1	<i>Enterococcus faecalis</i>
352	ef00108_1_1	<i>Enterococcus faecalis</i>
353	ef00109_1_1	<i>Enterococcus faecalis</i>
354	ef0011_1_1	<i>Enterococcus faecalis</i>
355	ef00113_1_1	<i>Enterococcus faecalis</i>
356	ef0012_1_1	<i>Enterococcus faecalis</i>
357	ef0022_1_1	<i>Enterococcus faecalis</i>
358	ef0031_1_1	<i>Enterococcus faecalis</i>
359	ef0032_1_1	<i>Enterococcus faecalis</i>
360	ef0040_1_1	<i>Enterococcus faecalis</i>
361	ef0058_1_1	<i>Enterococcus faecalis</i>
362	enlA_1_1	<i>Enterococcus faecalis</i>
363	esa_1_1	<i>Enterococcus faecalis</i>
364	esp_1_1	<i>Enterococcus faecalis</i>
365	gelE_1_1	<i>Enterococcus faecalis</i>

SEQ ID NO	Probe name	Template source
366	groEL_1_1	<i>Enterococcus faecalis</i>
367	groES_1_1	<i>Enterococcus faecalis</i>
368	rt1_1_1	<i>Enterococcus faecalis</i>
369	sala_1_1	<i>Enterococcus faecalis</i>
370	salb_1_1	<i>Enterococcus faecalis</i>
371	sea1_1_1	<i>Enterococcus faecalis</i>
372	sep1_1_1	<i>Enterococcus faecalis</i>
373	vicK_1_1	<i>Enterococcus faecalis</i>
374	yycH_1_1	<i>Enterococcus faecalis</i>
375	yycI_1_1	<i>Enterococcus faecalis</i>
376	yycJ_1_1	<i>Enterococcus faecalis</i>
377	bglB_1_1	<i>Enterococcus faecium</i>
378	bglR_1_1	<i>Enterococcus faecium</i>
379	bglS_1_1	<i>Enterococcus faecium</i>
380	efmA_1_1	<i>Enterococcus faecium</i>
381	efmB_1_1	<i>Enterococcus faecium</i>
382	efmC_1_1	<i>Enterococcus faecium</i>
383	mreC_1_1	<i>Enterococcus faecium</i>
384	mreD_1_1	<i>Enterococcus faecium</i>
385	mvaDEfaecium_1_1	<i>Enterococcus faecium</i>
386	mvaEEfaecium_1_1	<i>Enterococcus faecium</i>
387	mvaK1Efaecium_1_1	<i>Enterococcus faecium</i>
388	mvaK2Efaecium_1_1	<i>Enterococcus faecium</i>
389	mvaSEfaecium_1_1	<i>Enterococcus faecium</i>
390	orf3_4Efaeciumb_1_1	<i>Enterococcus faecium</i>
391	orf6_7Efaecium_1_1	<i>Enterococcus faecium</i>
392	orf7_8Efaecium_1_1	<i>Enterococcus faecium</i>
393	orf9_10Efaecium_1_1	<i>Enterococcus faecium</i>
394	entA_entI_1_1	<i>Enterococcus faecium</i>
395	entD_1_1	<i>Enterococcus faecium</i>
396	entR_1_1	<i>Enterococcus faecium</i>
397	oep_1_1	<i>Enterococcus faecium</i>
398	sagA_1_2	<i>Enterococcus faecium</i>
399	atsA_1_1	<i>Klebsiella pneumoniae</i>
400	atsB_1_1	<i>Klebsiella pneumoniae</i>
401	budC_1_1	<i>Klebsiella pneumoniae</i>
402	citA_1_1	<i>Klebsiella pneumoniae</i>
403	citW_1_1	<i>Klebsiella pneumoniae</i>
404	citX_1_1	<i>Klebsiella pneumoniae</i>
405	dalD_1_1	<i>Klebsiella pneumoniae</i>
406	dalK_1_1	<i>Klebsiella pneumoniae</i>
407	dalT_1_1	<i>Klebsiella pneumoniae</i>
408	acoA_1_1	<i>Klebsiella pneumoniae</i>
409	acoB_1_1	<i>Klebsiella pneumoniae</i>
410	acoC_1_1	<i>Klebsiella pneumoniae</i>
411	ahIK_1_1	<i>Klebsiella pneumoniae</i>

SEQ ID NO	Probe name	Template source
412	fimK_1_1	<i>Klebsiella pneumoniae</i>
413	glfKPN2_1_1	<i>Klebsiella pneumoniae</i>
414	ltrA_1_1	<i>Klebsiella pneumoniae</i>
415	mdcC_1_1	<i>Klebsiella pneumoniae</i>
416	mdcF_1_1	<i>Klebsiella pneumoniae</i>
417	mdcH_1_1	<i>Klebsiella pneumoniae</i>
418	mrkA_1_1	<i>Klebsiella pneumoniae</i>
419	mtrK_1_1	<i>Klebsiella pneumoniae</i>
420	nifF_1_1	<i>Klebsiella pneumoniae</i>
421	nifK_1_1	<i>Klebsiella pneumoniae</i>
422	nifN_1_1	<i>Klebsiella pneumoniae</i>
423	tyrP_1_1	<i>Klebsiella pneumoniae</i>
424	ureA_1_1	<i>Klebsiella pneumoniae</i>
425	wbbO_1_1	<i>Klebsiella pneumoniae</i>
426	wza_1_1	<i>Klebsiella pneumoniae</i>
427	wzb_1_1	<i>Klebsiella pneumoniae</i>
428	wzmKPN2_1_1	<i>Klebsiella pneumoniae</i>
429	wztKPN2_1_1	<i>Klebsiella pneumoniae</i>
430	yojH_1_1	<i>Klebsiella pneumoniae</i>
431	liac_1_1	<i>Klebsiella pneumoniae</i>
432	cim_1_1	<i>Klebsiella pneumoniae</i>
433	aldA_1_1	<i>Klebsiella pneumoniae</i>
434	aldA_2_1	<i>Klebsiella pneumoniae</i>
435	hemly_1_1	<i>Klebsiella pneumoniae</i>
436	pSL017_1_1	<i>Klebsiella pneumoniae</i>
437	pSL020_1_1	<i>Klebsiella pneumoniae</i>
438	rcaA_1_1	<i>Klebsiella pneumoniae</i>
439	rmlC_1_1	<i>Klebsiella pneumoniae</i>
440	rmlD_1_1	<i>Klebsiella pneumoniae</i>
441	waaG_1_1	<i>Klebsiella pneumoniae</i>
442	wbbD_1_1	<i>Klebsiella pneumoniae</i>
443	wbbM_1_1	<i>Klebsiella pneumoniae</i>
444	wbbN_1_1	<i>Klebsiella pneumoniae</i>
445	wbdA_1_1	<i>Klebsiella pneumoniae</i>
446	wbdC_1_1	<i>Klebsiella pneumoniae</i>
447	wztKpn_1_1	<i>Klebsiella pneumoniae</i>
448	yibD_1_1	<i>Klebsiella pneumoniae</i>
449	cymA_1_1	<i>Klebsiella oxytoca</i>
450	cymD_1_1	<i>Klebsiella oxytoca</i>
451	cymE_1_1	<i>Klebsiella oxytoca</i>
452	cymH_1_1	<i>Klebsiella oxytoca</i>
453	cymI_1_1	<i>Klebsiella oxytoca</i>
454	cymJ_1_1	<i>Klebsiella oxytoca</i>
455	ddrA_1_1	<i>Klebsiella oxytoca</i>
456	fdt-1_1_1	<i>Klebsiella oxytoca</i>
457	fdt-2_1_1	<i>Klebsiella oxytoca</i>

SEQ ID NO	Probe name	Template source
458	fdt-3_1_1	<i>Klebsiella oxytoca</i>
459	gatY_1_1	<i>Klebsiella oxytoca</i>
460	hydH_1_1	<i>Klebsiella oxytoca</i>
461	masA_1_1	<i>Klebsiella oxytoca</i>
462	nasA_1_1	<i>Klebsiella oxytoca</i>
463	nasE_1_1	<i>Klebsiella oxytoca</i>
464	nasF_1_1	<i>Klebsiella oxytoca</i>
465	pehX_1_1	<i>Klebsiella oxytoca</i>
466	pelX_1_1	<i>Klebsiella oxytoca</i>
467	tagH_1_1	<i>Klebsiella oxytoca</i>
468	tagK_1_1	<i>Klebsiella oxytoca</i>
469	tagT_1_1	<i>Klebsiella oxytoca</i>
470	glpR_1_1	<i>Pseudomonas aeruginosa</i>
471	lasRb_1_1	<i>Pseudomonas aeruginosa</i>
472	OrfX_1_1	<i>Pseudomonas aeruginosa</i>
473	pa0260_1_1	<i>Pseudomonas aeruginosa</i>
474	pa0572_1_1	<i>Pseudomonas aeruginosa</i>
475	pa0625_1_1	<i>Pseudomonas aeruginosa</i>
476	pa0636_1_1	<i>Pseudomonas aeruginosa</i>
477	pa1046_1_1	<i>Pseudomonas aeruginosa</i>
478	pa1069_1_1	<i>Pseudomonas aeruginosa</i>
479	pa1846_1_1	<i>Pseudomonas aeruginosa</i>
480	pa3866_1_1	<i>Pseudomonas aeruginosa</i>
481	pa4082_1_1	<i>Pseudomonas aeruginosa</i>
482	pilAp_1_1	<i>Pseudomonas aeruginosa</i>
483	PilAp2_1_1	<i>Pseudomonas aeruginosa</i>
484	pilC_1_1	<i>Pseudomonas aeruginosa</i>
485	PstP_1_1	<i>Pseudomonas aeruginosa</i>
486	purK_1_1	<i>Pseudomonas aeruginosa</i>
487	uvrDII_1_1	<i>Pseudomonas aeruginosa</i>
488	vsmI_1_1	<i>Pseudomonas aeruginosa</i>
489	vsmR_1_2	<i>Pseudomonas aeruginosa</i>
490	xcpX_1_1	<i>Pseudomonas aeruginosa</i>
491	aprA_1_1	<i>Pseudomonas aeruginosa</i>
492	aprE_1_1	<i>Pseudomonas aeruginosa</i>
493	ctx_1_2	<i>Pseudomonas aeruginosa</i>
494	algB_1_1	<i>Pseudomonas aeruginosa</i>
495	algN_1_1	<i>Pseudomonas aeruginosa</i>
496	algR_1_1	<i>Pseudomonas aeruginosa</i>
497	ExoS_1_1	<i>Pseudomonas aeruginosa</i>
498	fpvA_1_1	<i>Pseudomonas aeruginosa</i>
499	lasRa_1_1	<i>Pseudomonas aeruginosa</i>
500	lipA_1_1	<i>Pseudomonas aeruginosa</i>
501	lipH_1_1	<i>Pseudomonas aeruginosa</i>
502	Orf159_1_2	<i>Pseudomonas aeruginosa</i>
503	Orf252_1_1	<i>Pseudomonas aeruginosa</i>

SEQ ID NO	Probe name	Template source
504	pchG_1_1	<i>Pseudomonas aeruginosa</i>
505	PhzA_1_1	<i>Pseudomonas aeruginosa</i>
506	PhzB_1_1	<i>Pseudomonas aeruginosa</i>
507	PLC_1_1	<i>Pseudomonas aeruginosa</i>
508	plcN_1_1	<i>Pseudomonas aeruginosa</i>
509	plcR_1_1	<i>Pseudomonas aeruginosa</i>
510	pvdD_1_1	<i>Pseudomonas aeruginosa</i>
511	pvdF_1_2	<i>Pseudomonas aeruginosa</i>
512	pyocinS1_1_1	<i>Pseudomonas aeruginosa</i>
513	pyocinS1im_1_1	<i>Pseudomonas aeruginosa</i>
514	pyocinS2_1_1	<i>Pseudomonas aeruginosa</i>
515	pys2_1_1	<i>Pseudomonas aeruginosa</i>
516	pys2_2_1	<i>Pseudomonas aeruginosa</i>
517	rbf303_1_1	<i>Pseudomonas aeruginosa</i>
518	rhIA_1_1	<i>Pseudomonas aeruginosa</i>
519	rhIB_1_1	<i>Pseudomonas aeruginosa</i>
520	rhIR_1_1	<i>Pseudomonas aeruginosa</i>
521	TnAP41_1_2	<i>Pseudomonas aeruginosa</i>
522	toxA_1_1	<i>Pseudomonas aeruginosa</i>
523	cap1ESTrpneu_1_1	<i>Streptococcus pneumoniae</i>
524	cap1FStrpneu_1_1	<i>Streptococcus pneumoniae</i>
525	cap1GStrpneu_1_1	<i>Streptococcus pneumoniae</i>
526	cap3AStrpneu_1_1	<i>Streptococcus pneumoniae</i>
527	cap3BStrpneu_1_1	<i>Streptococcus pneumoniae</i>
528	celAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
529	celBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
530	cglAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
531	cglBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
532	cglCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
533	cglDStrpneu_1_1	<i>Streptococcus pneumoniae</i>
534	cinA_1_1	<i>Streptococcus pneumoniae</i>
535	cps14ESTrpneum_1_1	<i>Streptococcus pneumoniae</i>
536	cps14FStrpneum_1_1	<i>Streptococcus pneumoniae</i>
537	cps14GStrpneum_1_1	<i>Streptococcus pneumoniae</i>
538	cps14HStrpneum_1_1	<i>Streptococcus pneumoniae</i>
539	cps19aHStrpneum_1_1	<i>Streptococcus pneumoniae</i>
540	cps19aIStrpneum_1_1	<i>Streptococcus pneumoniae</i>
541	cps19aKStrpneum_1_1	<i>Streptococcus pneumoniae</i>
542	cps19fGStrpneum_1_1	<i>Streptococcus pneumoniae</i>
543	cps23fGStrpneum_1_1	<i>Streptococcus pneumoniae</i>
544	dexB_1_1	<i>Streptococcus pneumoniae</i>
545	dinF_1_1	<i>Streptococcus pneumoniae</i>
546	1760Strpneu_1_1	<i>Streptococcus pneumoniae</i>
547	acyPStrpneu_1_1	<i>Streptococcus pneumoniae</i>
548	endAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
549	exoAStrpneu_1_1	<i>Streptococcus pneumoniae</i>

SEQ ID NO	Probe name	Template source
550	exp72_1_1	<i>Streptococcus pneumoniae</i>
551	fnlAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
552	fnlBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
553	fnlCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
554	gct18Strpneu_1_1	<i>Streptococcus pneumoniae</i>
555	hexB1_1_1	<i>Streptococcus pneumoniae</i>
556	hftsHstrpneu_1_1	<i>Streptococcus pneumoniae</i>
557	immunofrag1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
558	immunofrag2Strpneu_2_1	<i>Streptococcus pneumoniae</i>
559	immunofrag3Strpneu_2_1	<i>Streptococcus pneumoniae</i>
560	kdtBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
561	lysAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
562	pcpBStrpneu_1_1	<i>Streptococcus pneumoniae</i>
563	pflCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
564	plpA_1_1	<i>Streptococcus pneumoniae</i>
565	prtA1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
566	pspC1Strpneu_1_1	<i>Streptococcus pneumoniae</i>
567	pspC2_1_1	<i>Streptococcus pneumoniae</i>
568	purRStrpneu_1_1	<i>Streptococcus pneumoniae</i>
569	pyrDAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
570	SP0828Strpneu_1_1	<i>Streptococcus pneumoniae</i>
571	SP0830Strpneu_1_1	<i>Streptococcus pneumoniae</i>
572	SP0833Strpneu_1_1	<i>Streptococcus pneumoniae</i>
573	SP0837_38Strpneu_1_1	<i>Streptococcus pneumoniae</i>
574	SP0839Strpneu_1_1	<i>Streptococcus pneumoniae</i>
575	ugdStrpneu_1_1	<i>Streptococcus pneumoniae</i>
576	uncC_1_1	<i>Streptococcus pneumoniae</i>
577	vicXStrepneu_1_1	<i>Streptococcus pneumoniae</i>
578	wchA6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
579	wci4Strpneu_1_1	<i>Streptococcus pneumoniae</i>
580	wciK4Strpneu_1_1	<i>Streptococcus pneumoniae</i>
581	wciL4Strpneu_1_1	<i>Streptococcus pneumoniae</i>
582	wciN6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
583	wciO6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
584	wciP6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
585	wciY18Strpneu_1_1	<i>Streptococcus pneumoniae</i>
586	wzdbStrpneu_1_1	<i>Streptococcus pneumoniae</i>
587	wze6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
588	wzy18Strpneu_1_1	<i>Streptococcus pneumoniae</i>
589	wzy4Strpneu_1_1	<i>Streptococcus pneumoniae</i>
590	wzy6bStrpneu_1_1	<i>Streptococcus pneumoniae</i>
591	xpt_1_1	<i>Streptococcus pneumoniae</i>
592	igaStrpneu_1_1	<i>Streptococcus pneumoniae</i>
593	lytA_1_1	<i>Streptococcus pneumoniae</i>
594	nanA_1_1	<i>Streptococcus pneumoniae</i>
595	nanBStrpneu_1_1	<i>Streptococcus pneumoniae</i>

SEQ ID NO	Probe name	Template source
596	pcpCStrpneu_1_1	<i>Streptococcus pneumoniae</i>
597	ply_1_1	<i>Streptococcus pneumoniae</i>
598	prtAStrpneu_1_1	<i>Streptococcus pneumoniae</i>
599	pspA_1_2	<i>Streptococcus pneumoniae</i>
600	SP0834Strpneu_1_1	<i>Streptococcus pneumoniae</i>
601	SP0834Strpneu_1_2	<i>Streptococcus pneumoniae</i>
602	sphtraStrpneu_1_1	<i>Streptococcus pneumoniae</i>
603	wciJStrpneu_1_1	<i>Streptococcus pneumoniae</i>
604	wziYStrpneu_1_1	<i>Streptococcus pneumoniae</i>
605	wzxStrpneu_1_1	<i>Streptococcus pneumoniae</i>
606	cpsA1Strgal_1_1	<i>Streptococcus agalactiae</i>
607	cpsB1Strgal_1_1	<i>Streptococcus agalactiae</i>
608	cpsC1Strgal_1_1	<i>Streptococcus agalactiae</i>
609	cpsD1Strgal_1_1	<i>Streptococcus agalactiae</i>
610	cpsE1Strgal_1_1	<i>Streptococcus agalactiae</i>
611	cpsG1Strgal_1_1	<i>Streptococcus agalactiae</i>
612	cpsI1Strgal_1_1	<i>Streptococcus agalactiae</i>
613	cpsJ1Strgal_1_1	<i>Streptococcus agalactiae</i>
614	cpsK1Strgal_1_1	<i>Streptococcus agalactiae</i>
615	cpsM1Strgal_1_1	<i>Streptococcus agalactiae</i>
616	cpsY1Strgal_1_1	<i>Streptococcus agalactiae</i>
617	cpsY2Strgal_2_1	<i>Streptococcus agalactiae</i>
618	cylB1Straga_1_1	<i>Streptococcus agalactiae</i>
619	cylE1Straga_1_1	<i>Streptococcus agalactiae</i>
620	cylF1Straga_1_1	<i>Streptococcus agalactiae</i>
621	cylH1Straga_1_1	<i>Streptococcus agalactiae</i>
622	cylI1Straga_1_1	<i>Streptococcus agalactiae</i>
623	cylJ1Straga_1_1	<i>Streptococcus agalactiae</i>
624	cylK1Straga_1_1	<i>Streptococcus agalactiae</i>
625	0487Straga_1_1	<i>Streptococcus agalactiae</i>
626	0488Straga_1_1	<i>Streptococcus agalactiae</i>
627	0493Straga_1_1	<i>Streptococcus agalactiae</i>
628	0495Straga_1_1	<i>Streptococcus agalactiae</i>
629	0498Straga_1_1	<i>Streptococcus agalactiae</i>
630	0500Straga_1_1	<i>Streptococcus agalactiae</i>
631	0502Straga_1_1	<i>Streptococcus agalactiae</i>
632	0504Straga_1_1	<i>Streptococcus agalactiae</i>
633	fold1Straga_1_1	<i>Streptococcus agalactiae</i>
634	neuA1Strgal_1_1	<i>Streptococcus agalactiae</i>
635	neuB1Strgal_1_1	<i>Streptococcus agalactiae</i>
636	neuC1Strgal_1_1	<i>Streptococcus agalactiae</i>
637	neuD1Strgal_1_1	<i>Streptococcus agalactiae</i>
638	recN1Straga_1_1	<i>Streptococcus agalactiae</i>
639	ileS1Straga_1_1	<i>Streptococcus agalactiae</i>
640	CAMPfactor_1_1	<i>Streptococcus agalactiae</i>
641	CAMPfactor_2_1	<i>Streptococcus agalactiae</i>

SEQ ID NO	Probe name	Template source
642	0499Straga_1_1	<i>Streptococcus agalactiae</i>
643	hylStragal_1_1	<i>Streptococcus agalactiae</i>
644	lipStragal_1_1	<i>Streptococcus agalactiae</i>
645	cyclStrpyog_1_1	<i>Streptococcus pyogenes</i>
646	fah_rph_hlo_Strpyog_1_1	<i>Streptococcus pyogenes</i>
647	int_1_1	<i>Streptococcus pyogenes</i>
648	int315.5_1_1	<i>Streptococcus pyogenes</i>
649	murEStrpyog_1_1	<i>Streptococcus pyogenes</i>
650	oppA_1_1	<i>Streptococcus pyogenes</i>
651	oppCStrpyog_1_1	<i>Streptococcus pyogenes</i>
652	oppD_1_1	<i>Streptococcus pyogenes</i>
653	SPy0382Strpyog_1_1	<i>Streptococcus pyogenes</i>
654	SPy0390Strpyog_1_1	<i>Streptococcus pyogenes</i>
655	SpyM3_1351_1_1	<i>Streptococcus pyogenes</i>
656	vicXStrpyog_1_1	<i>Streptococcus pyogenes</i>
657	DNaseIStrpyog_1_1	<i>Streptococcus pyogenes</i>
658	fba2Strpyog_1_1	<i>Streptococcus pyogenes</i>
659	fhuAStrpyog_1_1	<i>Streptococcus pyogenes</i>
660	fhuB1Strpyog_1_1	<i>Streptococcus pyogenes</i>
661	fhuDStrpyog_1_1	<i>Streptococcus pyogenes</i>
662	fhuGStrpyog_1_1	<i>Streptococcus pyogenes</i>
663	hyla_1_1	<i>Streptococcus pyogenes</i>
664	hyIP_1_1	<i>Streptococcus pyogenes</i>
665	hyIP2_1_1	<i>Streptococcus pyogenes</i>
666	oppB_1_1	<i>Streptococcus pyogenes</i>
667	ropB_1_1	<i>Streptococcus pyogenes</i>
668	scpAStrpyog_1_1	<i>Streptococcus pyogenes</i>
669	sloStrpyog_1_1	<i>Streptococcus pyogenes</i>
670	smez-4Strpyog_1_1	<i>Streptococcus pyogenes</i>
671	sof_1_1	<i>Streptococcus pyogenes</i>
672	sof_2_1	<i>Streptococcus pyogenes</i>
673	speA_1_1	<i>Streptococcus pyogenes</i>
674	speB2Strpyog_1_1	<i>Streptococcus pyogenes</i>
675	speCStrpyog_1_1	<i>Streptococcus pyogenes</i>
676	speJStrpyog_1_1	<i>Streptococcus pyogenes</i>
677	srtBStrpyog_1_1	<i>Streptococcus pyogenes</i>
678	srtCStrpyog_1_1	<i>Streptococcus pyogenes</i>
679	srtEStrpyog_1_1	<i>Streptococcus pyogenes</i>
680	srtFStrpyog_1_1	<i>Streptococcus pyogenes</i>
681	srtGStrpyog_1_1	<i>Streptococcus pyogenes</i>
682	srtIStrpyog_1_1	<i>Streptococcus pyogenes</i>
683	srtKStrpyog_1_1	<i>Streptococcus pyogenes</i>
684	srtRStrpyog_1_1	<i>Streptococcus pyogenes</i>
685	srtTStrpyog_1_1	<i>Streptococcus pyogenes</i>
686	vickStrpyog_1_1	<i>Streptococcus pyogenes</i>
687	573Stprmut_1_1	<i>Streptococcus viridans</i>

SEQ ID NO	Probe name	Template source
688	580SStprmut_1_1	<i>Streptococcus viridans</i>
689	581_582SStprmut_1_1	<i>Streptococcus viridans</i>
690	584SStprmut_1_1	<i>Streptococcus viridans</i>
691	dltAStrmut_1_1	<i>Streptococcus viridans</i>
692	dltBStrmut_1_1	<i>Streptococcus viridans</i>
693	dltCpx1Strmut_1_1	<i>Streptococcus viridans</i>
694	dltDStrmut_1_1	<i>Streptococcus viridans</i>
695	lichStrbov_1_1	<i>Streptococcus viridans</i>
696	lytRStprmut_1_1	<i>Streptococcus viridans</i>
697	lytSStprmut_1_1	<i>Streptococcus viridans</i>
698	pepQStrrmut_1_1	<i>Streptococcus viridans</i>
699	pflCStrmut_1_1	<i>Streptococcus viridans</i>
700	recNStprmut_1_1	<i>Streptococcus viridans</i>
701	ytqBStrmut_1_1	<i>Streptococcus viridans</i>
702	hlyXStrmut_1_1	<i>Streptococcus viridans</i>
703	igaStrmitis_1_1	<i>Streptococcus viridans</i>
704	igaStrsanguis_1_1	<i>Streptococcus viridans</i>
705	perMStrmut_1_1	<i>Streptococcus viridans</i>
706	atfA_1_1	<i>Proteus mirabilis</i>
707	atfB_1_1	<i>Proteus mirabilis</i>
708	atfC_1_1	<i>Proteus mirabilis</i>
709	ccmPrmi1_1_1	<i>Proteus mirabilis</i>
710	cyaPrmi_1_1	<i>Proteus mirabilis</i>
711	aad_1_1	<i>Proteus mirabilis</i>
712	flfB_1_1	<i>Proteus mirabilis</i>
713	flfD_1_1	<i>Proteus mirabilis</i>
714	flfN_1_1	<i>Proteus mirabilis</i>
715	flhD_1_1	<i>Proteus mirabilis</i>
716	floA_1_1	<i>Proteus mirabilis</i>
717	ftsK_1_1	<i>Proteus mirabilis</i>
718	gstB_1_1	<i>Proteus mirabilis</i>
719	hemCPrmi_1_1	<i>Proteus mirabilis</i>
720	hemDPrmi_1_1	<i>Proteus mirabilis</i>
721	hev_1_1	<i>Proteus mirabilis</i>
722	katA_1_1	<i>Proteus mirabilis</i>
723	lpp1_1_1	<i>Proteus mirabilis</i>
724	menE_1_1	<i>Proteus mirabilis</i>
725	mfd_1_1	<i>Proteus mirabilis</i>
726	nrpA_1_1	<i>Proteus mirabilis</i>
727	nrpB_1_1	<i>Proteus mirabilis</i>
728	nrpG_1_1	<i>Proteus mirabilis</i>
729	nrpS_1_1	<i>Proteus mirabilis</i>
730	nrpT_1_1	<i>Proteus mirabilis</i>
731	nrpU_1_1	<i>Proteus mirabilis</i>
732	pat_1_1	<i>Proteus mirabilis</i>
733	pmfA_1_1	<i>Proteus mirabilis</i>

SEQ ID NO	Probe name	Template source
734	pmfC_1_1	<i>Proteus mirabilis</i>
735	pmfE_1_1	<i>Proteus mirabilis</i>
736	ppaA_1_1	<i>Proteus mirabilis</i>
737	rsbA_1_1	<i>Proteus mirabilis</i>
738	rsbC_1_1	<i>Proteus mirabilis</i>
739	speB_1_1	<i>Proteus mirabilis</i>
740	stmA_1_1	<i>Proteus mirabilis</i>
741	stmB_1_1	<i>Proteus mirabilis</i>
742	terA_1_1	<i>Proteus mirabilis</i>
743	terD_1_1	<i>Proteus mirabilis</i>
744	umoA_1_1	<i>Proteus mirabilis</i>
745	umoB_1_1	<i>Proteus mirabilis</i>
746	umoC_1_1	<i>Proteus mirabilis</i>
747	ureR_1_1	<i>Proteus mirabilis</i>
748	xerC_1_1	<i>Proteus mirabilis</i>
749	ygbA_1_1	<i>Proteus mirabilis</i>
750	flaA_1_1	<i>Proteus mirabilis</i>
751	flaD_1_1	<i>Proteus mirabilis</i>
752	fliA_1_1	<i>Proteus mirabilis</i>
753	hpmA_1_1	<i>Proteus mirabilis</i>
754	hpmB_1_1	<i>Proteus mirabilis</i>
755	lpsPrmi_1_1	<i>Proteus mirabilis</i>
756	mrpA_1_1	<i>Proteus mirabilis</i>
757	mrpB_1_1	<i>Proteus mirabilis</i>
758	mrpC_1_1	<i>Proteus mirabilis</i>
759	mrpD_1_1	<i>Proteus mirabilis</i>
760	mrpE_1_1	<i>Proteus mirabilis</i>
761	mrpF_1_1	<i>Proteus mirabilis</i>
762	mrpG_1_1	<i>Proteus mirabilis</i>
763	mrpH_1_1	<i>Proteus mirabilis</i>
764	mrpI_1_1	<i>Proteus mirabilis</i>
765	mrpJ_1_1	<i>Proteus mirabilis</i>
766	pata_1_1	<i>Proteus mirabilis</i>
767	putA_1_1	<i>Proteus mirabilis</i>
768	uca_1_1	<i>Proteus mirabilis</i>
769	ureDPrmi_1_1	<i>Proteus mirabilis</i>
770	ureEPrmi_1_1	<i>Proteus mirabilis</i>
771	ureFPrmi_1_1	<i>Proteus mirabilis</i>
772	zapA_1_1	<i>Proteus mirabilis</i>
773	zapB_1_1	<i>Proteus mirabilis</i>
774	zapD_1_1	<i>Proteus mirabilis</i>
775	zapE_1_1	<i>Proteus mirabilis</i>
776	envZPrvu_1_1	<i>Proteus vulgaris</i>
777	frdC_1_1	<i>Proteus vulgaris</i>
778	frdD_1_1	<i>Proteus vulgaris</i>
779	infBPrvu_1_1	<i>Proteus vulgaris</i>

SEQ ID NO	Probe name	Template source
780	lad_1_1	<i>Proteus vulgaris</i>
781	tna2_1_1	<i>Proteus vulgaris</i>
782	end_1_1	<i>Proteus vulgaris</i>
783	pqrA_1_1	<i>Proteus vulgaris</i>
784	urg_1_1	<i>Proteus vulgaris</i>
785	blaIMP-7_1_1	<i>Pseudomonas aeruginosa</i>
786	mecISepid_1_1	<i>Staphylococcus epidermidis</i>
787	blaOXA-10_1_2	<i>Pseudomonas aeruginosa</i>
788	blaB_1_1	<i>Proteus vulgaris</i>
789	ampC_1_1	<i>Klebsiella oxytoca</i>
790	I-blaR_1_1	<i>Staphylococcus aureus</i>
791	blaOXA-32_1_1	<i>Pseudomonas aeruginosa</i>
792	bla-CTX-M-22_1_1	<i>Klebsiella pneumoniae</i>
793	pbp2aStrpneu_1_1	<i>Streptococcus pneumoniae</i>
794	blaSHV-1_1_1	<i>Klebsiella pneumoniae</i>
795	blaOXA-2_1_1	<i>Salmonella typhimurium</i>
796	blaRShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
797	blaIMP-7_1_2	<i>Pseudomonas aeruginosa</i>
798	I-mecR_1_1	<i>Staphylococcus aureus</i>
799	blaOXY_1_1	<i>Klebsiella oxytoca</i>
800	dacCStrpyog_1_1	<i>Streptococcus pyogenes</i>
801	femA_1_1	<i>Staphylococcus aureus</i>
802	mecA_1_1	<i>Staphylococcus aureus</i>
803	blaIShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
804	blavim_1_1	<i>Pseudomonas aeruginosa</i>
805	pbp2b_1_1	<i>Streptococcus pneumoniae</i>
806	pbp2primeSepid_1_1	<i>Staphylococcus epidermidis</i>
807	pbp2x_1_1	<i>Streptococcus pneumoniae</i>
808	pbp3Saureuc_1_1	<i>Staphylococcus aureus</i>
809	pbp4_1_1	<i>Enterococcus faecalis</i>
810	pbp5Efaecium_1_1	<i>Enterococcus faecium</i>
811	pbpC_1_1	<i>Enterococcus faecalis</i>
812	I-mecI_1_1	<i>Staphylococcus aureus</i>
813	pbp1a_1_1	<i>Streptococcus pneumoniae</i>
814	I-blaI_1_1	<i>Staphylococcus aureus</i>
815	blaTEM-106_1_1	<i>Escherichia coli</i>
816	blaOXY-KLOX_1_1	<i>Klebsiella oxytoca</i>
817	ftsWEF_1_1	<i>Enterococcus faecium</i>
818	fmhB_1_1	<i>Staphylococcus aureus</i>
819	cumA_1_1	<i>Proteus vulgaris</i>
820	femBShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
821	blaPER-1_1_1	<i>Pseudomonas aeruginosa</i>
822	bla_FOX-3_1_1	<i>Klebsiella oxytoca</i>
823	blaA_1_1	<i>Proteus vulgaris</i>
824	psrb_1_1	<i>Enterococcus faecium</i>
825	fmhA_1_1	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
826	mecR1Sepid_1_1	<i>Staphylococcus epidermidis</i>
827	blaZ_1_1	<i>Staphylococcus aureus</i>
828	blaOXA-1_1_1	Plasmid RGN238
829	fox-6_1_1	<i>Klebsiella pneumoniae</i>
830	blaPrmi_1_1	<i>Proteus mirabilis</i>
831	aacA_aphDStwar_1_1	<i>Staphylococcus warneri</i>
832	aacC1_1_2	<i>Pseudomonas aeruginosa</i>
833	aacC2_1_1	<i>Escherichia coli</i>
834	strB_1_1	<i>Escherichia coli</i>
835	aadA_1_1	<i>Enterococcus faecalis</i>
836	aadB_1_2	<i>Escherichia coli</i>
837	aadD_1_1	<i>Staphylococcus aureus</i>
838	aacA4_1_2	<i>Pseudomonas aeruginosa</i>
839	strA_1_1	<i>Escherichia coli</i>
840	aph-A3_1_1	<i>Staphylococcus aureus</i>
841	aacC1_1_1	<i>Pseudomonas aeruginosa</i>
842	aacA4_1_1	<i>Pseudomonas aeruginosa</i>
843	aacA-aphD_1_1	<i>Staphylococcus aureus</i>
844	I-spc_1_1	<i>Staphylococcus aureus</i>
845	aphA3_1_1	synthetic construct
846	ermC_1_1	<i>Staphylococcus aureus</i>
847	linB_1_1	<i>Enterococcus faecium</i>
848	satSA_1_1	<i>Staphylococcus aureus</i>
849	mdrSA_1_1	<i>Staphylococcus aureus</i>
850	I-linA_1_1	<i>Staphylococcus aureus</i>
851	ermB_1_2	<i>Staphylococcus aureus</i>
852	ermA_1_1	<i>Staphylococcus aureus</i>
853	satA_1_1	<i>Enterococcus faecium</i>
854	msrA_1_1	<i>Staphylococcus aureus</i>
855	mphBM_1_1	<i>Staphylococcus aureus</i>
856	mefA_1_1	<i>Streptococcus pyogenes</i>
857	mrX_1_1	<i>Escherichia coli</i>
858	dfrStrpneu_1_1	<i>Streptococcus pneumoniae</i>
859	dfrA_1_1	<i>Staphylococcus aureus</i>
860	cmlA5_1_1	<i>Escherichia coli</i>
861	catEfaecium_1_1	<i>Enterococcus faecium</i>
862	cat_1_1	<i>Staphylococcus aureus</i>
863	tetAJ_1_1	<i>Proteus mirabilis</i>
864	tetL_1_1	<i>Enterococcus faecalis</i>
865	tetM_1_1	<i>Enterococcus faecalis</i>
866	vanH(tn)_1_1	<i>Enterococcus faecium</i>
867	vanA_1_1	<i>Enterococcus faecium</i>
868	vanHB2_1_1	<i>Enterococcus faecium</i>
869	vanR_1_1	<i>Enterococcus faecium</i>
870	vanRB2_1_1	<i>Enterococcus faecium</i>
871	vanS(tn)_1_1	<i>Enterococcus faecium</i>

SEQ ID NO	Probe name	Template source
872	vanSB2_1_1	<i>Enterococcus faecium</i>
873	vanWB2_1_1	<i>Enterococcus faecium</i>
874	ddl_1_1	<i>Enterococcus faecalis</i>
875	ble_1_1	<i>Staphylococcus aureus</i>
876	vanXB2_1_1	<i>Enterococcus faecium</i>
877	vanY(tn)_1_1	<i>Enterococcus faecium</i>
878	vanYB2_1_1	<i>Enterococcus faecium</i>
879	vanB_1_1	<i>Enterococcus faecalis</i>
880	vanZ(tn)_1_1	<i>Enterococcus faecium</i>
881	vanC-2_1_1	<i>Enterococcus flavescens</i>
882	vanX(tn)_1_1	<i>Enterococcus faecium</i>
883	acrB_1_1	<i>Proteus mirabilis</i>
884	mexB_1_2	<i>Pseudomonas aeruginosa</i>
885	I-qacA_1_1	<i>Staphylococcus aureus</i>
886	sulI_1_1	<i>Escherichia coli</i>
887	sul_1_1	<i>Escherichia coli</i>
888	cadBStalugd_1_1	<i>Staphylococcus lugdunensis</i>
889	mexA_1_1	<i>Pseudomonas aeruginosa</i>
890	acrR_1_1	<i>Proteus mirabilis</i>
891	emeA_1_1	<i>Enterococcus faecalis</i>
892	acrA_1_1	<i>Proteus mirabilis</i>
893	rtn_1_1	<i>Proteus vulgaris</i>
894	abcXStrpmut_1_1	<i>Streptococcus mutans</i>
895	qacEdelta1_1_1	<i>Escherichia coli</i>
896	elkT-abcA_1_1	<i>Staphylococcus aureus</i>
897	I-cadA_1_1	<i>Staphylococcus aureus</i>
898	albA_1_1	<i>Klebsiella oxytoca</i>
899	wzm_1_1	<i>Klebsiella pneumoniae</i>
900	msrCb_1_1	<i>Enterococcus faecium</i>
901	nov_1_1	<i>Escherichia coli</i>
902	wzt_1_1	<i>Klebsiella pneumoniae</i>
903	wbbl_1_1	<i>Klebsiella pneumoniae</i>
904	norA23_1_1	<i>Staphylococcus aureus</i>
905	mexR_1_1	<i>Pseudomonas aeruginosa</i>
906	arr2_1_1	<i>Escherichia coli</i>
907	mreA_1_1	<i>Staphylococcus aureus</i>
908	I-cadC_1_1	<i>Staphylococcus aureus</i>
909	uvrA_1_1	<i>Enterococcus faecalis</i>
910	CRD2_1_1	<i>Candida albicans</i>
911	CDR1_1_1	<i>Candida albicans</i>
912	CDR1_2_1	<i>Candida albicans</i>
913	MET3_1_1	<i>Candida albicans</i>
914	FET3_1_1	<i>Candida albicans</i>
915	FTR2_1_1	<i>Candida albicans</i>
916	MDR1-7_1_1	<i>Candida albicans</i>
917	ERG11_1_1	<i>Candida albicans</i>

SEQ ID NO	Probe name	Template source
918	SEC20_1_1	<i>Candida albicans</i>
919	rbcl_1_1	<i>Glycine max</i>
920	LDHA(hu)_1_1	<i>Homo sapiens</i>
921	GAPD(hu)_1_1	<i>Homo sapiens</i>
922	b-Act(hu)_1_1	<i>Homo sapiens</i>
923	ARHGDIA(hu)_1_1	<i>Homo sapiens</i>
924	PGK1(hu)_1_1	<i>Homo sapiens</i>
925	rbcl_1_2	<i>Glycine max</i>
926	16SPa_1_1	<i>Pseudomonas aeruginosa</i>
927	23SEfaecium_2_1	<i>Enterococcus faecium</i>
928	16SSStrepyog_1_1	<i>Streptococcus pyogenes</i>
929	16SSStrepneu_1_1	<i>Streptococcus pneumoniae</i>
930	16SSStrepagalactiae_1_1	<i>Streptococcus agalactiae</i>
931	16SEfaecium_1_1	<i>Enterococcus faecium</i>
932	16SEfaecium_2_1	<i>Enterococcus faecium</i>
933	16SRNAEf_2_1	<i>Enterococcus faecalis</i>
934	16SKpn_1_1	<i>Klebsiella pneumoniae</i>
935	16SSa_3_1	<i>Staphylococcus aureus</i>
936	16SRNAEf_1_1	<i>Enterococcus faecalis</i>
937	16SShominis_1_1	<i>Staphylococcus hominis</i>
938	16SShaemolyt_1_1	<i>Staphylococcus haemolyticus</i>
939	23SEfaecium_1_1	<i>Enterococcus faecium</i>
940	16SrRNAPrmi_1_1	<i>Proteus mirabilis</i>
941	16SrRNAPrvu1_1_1	<i>Proteus vulgaris</i>
942	16SSa_1_1	<i>Staphylococcus aureus</i>
943	16SKlox_1_1	<i>Klebsiella oxytoca</i>
944	p53_1_1	<i>Mus musculus</i>
945	0135mihck_1_1	<i>Dictyostelium discoideum</i>
946	FAN_1_1	<i>Mus musculus</i>
947	0270cap_1_1	<i>Dictyostelium discoideum</i>
2842	16SSStrepdysgal_1_1	<i>Streptococcus dysgalactiae</i>
2843	carO_1_1	<i>Acinetobacter baumannii</i>
2844	gacS_1_1	<i>Acinetobacter baumannii</i>
2845	dhbA_1_1	<i>Acinetobacter baumannii</i>
2846	dhbB_1_1	<i>Acinetobacter baumannii</i>
2847	sid_1_1	<i>Acinetobacter baumannii</i>
2848	csuD_1_1	<i>Acinetobacter baumannii</i>
2849	csuC_1_1	<i>Acinetobacter baumannii</i>
2850	tnp-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2851	waaA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2852	csuB_1_1	<i>Acinetobacter baumannii</i>
2853	csuA_B_1_1	<i>Acinetobacter baumannii</i>
2854	csuA_1_1	<i>Acinetobacter baumannii</i>
2855	put1_1_1	<i>Acinetobacter baumannii</i>
2856	por_1_1	<i>Acinetobacter baumannii</i>
2857	abc_1_1	<i>Acinetobacter baumannii</i>

SEQ ID NO	Probe name	Template source
2858	furACIBA_1_1	<i>Acinetobacter baumannii</i>
2859	dec_1_1	<i>Acinetobacter baumannii</i>
2860	cysI_1_1	<i>Acinetobacter baumannii</i>
2861	trpE_1_1	<i>Acinetobacter baumannii</i>
2862	put3_1_1	<i>Acinetobacter baumannii</i>
2863	ompA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2864	aacA4ENCL_1_1	<i>Enterobacter cloacae</i>
2865	AdeR-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2866	adeA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2867	aac(6p)-lb7_1_1	<i>Enterobacter cloacae</i>
2868	adeB-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2869	adeC-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2870	AdeS-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2871	blaL2_1_1	<i>Stenotrophomonas maltophilia</i>
2872	blaMIR-3_1_1	<i>Enterobacter cloacae</i>
2873	ampR_1_1	<i>Enterobacter cloacae</i>
2874	ampC-ENCL_1_1	<i>Enterobacter cloacae</i>
2875	blaL1_1_1	<i>Stenotrophomonas maltophilia</i>
2876	asr_1_1	<i>Enterobacter cloacae</i>
2877	lacZ_1_1	<i>Enterobacter cloacae</i>
2878	ehuS_1_1	<i>Enterobacter cloacae</i>
2879	ehuV_1_1	<i>Enterobacter cloacae</i>
2880	slyA_1_1	<i>Enterobacter cloacae</i>
2881	ORF165_1_1	<i>Enterobacter cloacae</i>
2882	ehuU_1_1	<i>Enterobacter cloacae</i>
2883	ehuT_1_1	<i>Enterobacter cloacae</i>
2884	ORF295_1_1	<i>Enterobacter cloacae</i>
2885	ehuA_1_1	<i>Enterobacter cloacae</i>
2886	ORF400_1_1	<i>Enterobacter cloacae</i>
2887	H+ATPase_1_1	<i>Enterococcus faecium</i>
2888	sulII_1_1	<i>Acinetobacter baumannii</i>
2889	smeE_1_1	<i>Stenotrophomonas maltophilia</i>
2890	eE_1_1	<i>Stenotrophomonas maltophilia</i>
2891	StmPr1_1_1	<i>Stenotrophomonas maltophilia</i>
2892	eD_2_1	<i>Stenotrophomonas maltophilia</i>
2893	ppi_1_1	<i>Stenotrophomonas maltophilia</i>
2894	pmp-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2895	pam_1_1	<i>Stenotrophomonas maltophilia</i>
2896	ORF4-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2897	ORF2-STEMA_1_1	<i>Stenotrophomonas maltophilia</i>
2898	et_1_1	<i>Stenotrophomonas maltophilia</i>
2899	eF_1_1	<i>Stenotrophomonas maltophilia</i>
2900	StmPr2_1_1	<i>Stenotrophomonas maltophilia</i>
2901	smeF4494_1_1	<i>Stenotrophomonas maltophilia</i>
2902	coa_3_1	<i>Staphylococcus aureus</i>
2903	coa_2_2	<i>Staphylococcus aureus</i>

SEQ ID NO	Probe name	Template source
2904	fasCAXStrdysg_1_1	<i>Streptococcus dysgalactiae</i>
2905	sloStrep_1_1	<i>Streptococcus dysgalactiae</i>
2906	ydhK_1_1	<i>Staphylococcus hominis</i>
2907	tetA-ACIBA_1_1	<i>Acinetobacter baumannii</i>
2908	tetR-ACIBA_1_1	<i>Acinetobacter baumannii</i>

b) primer sequences

SEQ ID NO	Probe name	Direction
948	cataSaur_1_1	F(orward)
949	cataSaur_1_1	R(everse)
950	cataSaur_1_2	F
951	cataSaur_1_2	R
952	clfA_1_1	F
953	clfA_1_1	R
954	clfB_1_1	F
955	clfB_1_1	R
956	coa_1_1	F
957	coa_1_1	R
958	coa_1_2	F
959	coa_1_2	R
960	I-clpC_1_1	F
961	I-clpC_1_1	R
962	I-clpP_1_1	F
963	I-clpP_1_1	R
964	I-ctaA_1_1	F
965	I-ctaA_1_1	R
966	I-ctsR_1_1	F
967	I-ctsR_1_1	R
968	I-dltA_1_1	F
969	I-dltA_1_1	R
970	I-dltB_1_1	F
971	I-dltB_1_1	R
972	I-dltC_1_1	F
973	I-dltC_1_1	R
974	I-dnaK_1_1	F
975	I-dnaK_1_1	R
976	I-elkT_1_1	F
977	I-elkT_1_1	R
978	I-femD_1_1	F
979	I-femD_1_1	R
980	I-glnA_1_1	F
981	I-glnA_1_1	R
982	I-glnR_1_1	F

SEQ ID NO	Probe name	Direction
983	I-glnR_1_1	R
984	I-grlA_1_1	F
985	I-grlA_1_1	R
986	I-grlB_1_1	F
987	I-grlB_1_1	R
988	I-groEL_1_1	F
989	I-groEL_1_1	R
990	I-groES_1_1	F
991	I-groES_1_1	R
992	I-hemA_1_1	F
993	I-hemA_1_1	R
994	I-hemE_1_1	F
995	I-hemE_1_1	R
996	I-hemH_1_1	F
997	I-hemH_1_1	R
998	I-hemL_1_1	F
999	I-hemL_1_1	R
1000	I-hemY_1_1	F
1001	I-hemY_1_1	R
1002	I-lepA_1_1	F
1003	I-lepA_1_1	R
1004	I-lrgA_1_1	F
1005	I-lrgA_1_1	R
1006	I-lrgB_1_1	F
1007	I-lrgB_1_1	R
1008	I-lytM_1_1	F
1009	I-lytM_1_1	R
1010	I-menB_1_1	F
1011	I-menB_1_1	R
1012	I-menD_1_1	F
1013	I-menD_1_1	R
1014	I-menE_1_1	F
1015	I-menE_1_1	R
1016	I-menF_1_1	F
1017	I-menF_1_1	R
1018	I-mreB_1_1	F
1019	I-mreB_1_1	R
1020	I-mreR_1_1	F
1021	I-mreR_1_1	R
1022	I-mutL_1_1	F
1023	I-mutL_1_1	R
1024	I-mutS_1_1	F
1025	I-mutS_1_1	R
1026	I-NAG_1_1	F

SEQ ID NO	Probe name	Direction
1027	I-NAG_1_1	R
1028	I-pbg_1_1	F
1029	I-pbg_1_1	R
1030	I-pbpF_1_1	F
1031	I-pbpF_1_1	R
1032	I-pdhB_1_1	F
1033	I-pdhB_1_1	R
1034	I-pdhC_1_1	F
1035	I-pdhC_1_1	R
1036	I-rsbU_1_1	F
1037	I-rsbU_1_1	R
1038	I-rsbV_1_1	F
1039	I-rsbV_1_1	R
1040	I-rsbW_1_1	F
1041	I-rsbW_1_1	R
1042	I-sgp_1_1	F
1043	I-sgp_1_1	R
1044	I-sirR_1_1	F
1045	I-sirR_1_1	R
1046	I-sodA_1_1	F
1047	I-sodA_1_1	R
1048	I-sodB_1_1	F
1049	I-sodB_1_1	R
1050	I-sstA_1_1	F
1051	I-sstA_1_1	R
1052	I-sstB_1_1	F
1053	I-sstB_1_1	R
1054	I-sstC_1_1	F
1055	I-sstC_1_1	R
1056	I-sstD_1_1	F
1057	I-sstD_1_1	R
1058	I-trx_1_1	F
1059	I-trx_1_1	R
1060	I-yhiN_1_1	F
1061	I-yhiN_1_1	R
1062	epiP-bsaP_1_1	F
1063	epiP-bsaP_1_1	R
1064	geh_1_1	F
1065	geh_1_1	R
1066	gyrA_1_1	F
1067	gyrA_1_1	R
1068	gyrB_1_1	F
1069	gyrB_1_1	R
1070	hemB_1_1	F

SEQ ID NO	Probe name	Direction
1071	hemB_1_1	R
1072	hemC_1_1	F
1073	hemC_1_1	R
1074	hemD_1_1	F
1075	hemD_1_1	R
1076	hemN_1_1	F
1077	hemN_1_1	R
1078	hsdS_1_1	F
1079	hsdS_1_1	R
1080	hsdS_2_1	F
1081	hsdS_2_1	R
1082	lip_1_1	F
1083	lip_1_1	R
1084	menC_1_1	F
1085	menC_1_1	R
1086	murC_1_1	F
1087	murC_1_1	R
1088	nuc_1_1	F
1089	nuc_1_1	R
1090	pdhD_1_1	F
1091	pdhD_1_1	R
1092	rpoB_1_1	F
1093	rpoB_1_1	R
1094	SAV0431_1_1	F
1095	SAV0431_1_1	R
1096	SAV0439_1_1	F
1097	SAV0439_1_1	R
1098	SAV0440_1_1	F
1099	SAV0440_1_1	R
1100	SAV0441_1_1	F
1101	SAV0441_1_1	R
1102	sigB_1_1	F
1103	sigB_1_1	R
1104	spa_1_2	F
1105	spa_1_2	R
1106	sstC_1_1	F
1107	sstC_1_1	R
1108	tag_1_1	F
1109	tag_1_1	R
1110	tyrA_1_1	F
1111	tyrA_1_1	R
1112	I-aroC_1_1	F
1113	I-aroC_1_1	R
1114	I-aroA_1_1	F

SEQ ID NO	Probe name	Direction
1115	I-aroA_1_1	R
1116	I-cna_1_1	F
1117	I-cna_1_1	R
1118	I-ebpS_1_1	F
1119	I-ebpS_1_1	R
1120	I-eno_1_1	F
1121	I-eno_1_1	R
1122	I-fbpA_1_1	F
1123	I-fbpA_1_1	R
1124	I-fib_1_1	F
1125	I-fib_1_1	R
1126	I-fnbB_1_1	F
1127	I-fnbB_1_1	R
1128	I-srtA_1_1	F
1129	I-srtA_1_1	R
1130	I-stpC_1_1	F
1131	I-stpC_1_1	R
1132	I-fnbA_1_1	F
1133	I-fnbA_1_1	R
1134	I-spa_1_1	F
1135	I-spa_1_1	R
1136	I-aroE_1_1	F
1137	I-aroE_1_1	R
1138	I-aroF_1_1	F
1139	I-aroF_1_1	R
1140	I-aroG_1_1	F
1141	I-aroG_1_1	R
1142	I-asp23_1_1	F
1143	I-asp23_1_1	R
1144	I-atl_1_1	F
1145	I-atl_1_1	R
1146	bsaE_1_1	F
1147	bsaE_1_1	R
1148	bsaG_1_1	F
1149	bsaG_1_1	R
1150	cap5h_1_1	F
1151	cap5h_1_1	R
1152	cap5i_1_1	F
1153	cap5i_1_1	R
1154	cap5j_1_1	F
1155	cap5j_1_1	R
1156	cap5k_1_1	F
1157	cap5k_1_1	R
1158	cap8H_1_1	F

SEQ ID NO	Probe name	Direction
1159	cap8H_1_1	R
1160	cap8I_1_1	F
1161	cap8I_1_1	R
1162	cap8J_1_1	F
1163	cap8J_1_1	R
1164	cap8K_1_1	F
1165	cap8K_1_1	R
1166	I-hld_1_1	F
1167	I-hld_1_1	R
1168	I-hysA_1_1	F
1169	I-hysA_1_1	R
1170	I-IgGbg_1_1	F
1171	I-IgGbg_1_1	R
1172	EDIN_1_1	F
1173	EDIN_1_1	R
1174	eta_1_1	F
1175	eta_1_1	R
1176	etb_1_1	F
1177	etb_1_1	R
1178	hglA_1_1	F
1179	hglA_1_1	R
1180	hglA_2_1	F
1181	hglA_2_1	R
1182	hglB_1_1	F
1183	hglB_1_1	R
1184	hglC_2_1	F
1185	hglC_2_1	R
1186	hla_1_1	F
1187	hla_1_1	R
1188	hlb_1_2	F
1189	hlb_1_2	R
1190	lukF_1_1	F
1191	lukF_1_1	R
1192	lukS_1_1	F
1193	lukS_1_1	R
1194	lukS_2_1	F
1195	lukS_2_1	R
1196	NAG_1_1	F
1197	NAG_1_1	R
1198	sak_1_1	F
1199	sak_1_1	R
1200	sea_1_1	F
1201	sea_1_1	R
1202	seb_1_1	F

SEQ ID NO	Probe name	Direction
1203	seb_1_1	R
1204	sec1_1_1	F
1205	sec1_1_1	R
1206	seg_1_1	F
1207	seg_1_1	R
1208	seh_1_1	F
1209	seh_1_1	R
1210	sel_1_1	F
1211	sel_1_1	R
1212	set15_1_1	F
1213	set15_1_1	R
1214	set6_1_1	F
1215	set6_1_1	R
1216	set7_1_1	F
1217	set7_1_1	R
1218	set8_1_1	F
1219	set8_1_1	R
1220	sprV8_1_1	F
1221	sprV8_1_1	R
1222	tst_1_1	F
1223	tst_1_1	R
1224	I-sdrC_1_1	F
1225	I-sdrC_1_1	R
1226	I-sdrD_1_1	F
1227	I-sdrD_1_1	R
1228	I-sdrE_1_1	F
1229	I-sdrE_1_1	R
1230	b1169_1_1	F
1231	b1169_1_1	R
1232	envZ_1_1	F
1233	envZ_1_1	R
1234	fliCb_1_1	F
1235	fliCb_1_1	R
1236	nfrB_1_1	F
1237	nfrB_1_1	R
1238	nlpA_1_1	F
1239	nlpA_1_1	R
1240	pilAe_1_1	F
1241	pilAe_1_1	R
1242	yacH_1_1	F
1243	yacH_1_1	R
1244	yagX_1_1	F
1245	yagX_1_1	R
1246	ycdS_1_1	F

SEQ ID NO	Probe name	Direction
1247	ycdS_1_1	R
1248	yciQ_1_1	F
1249	yciQ_1_1	R
1250	ymcA_1_1	F
1251	ymcA_1_1	R
1252	b1202_1_1	F
1253	b1202_1_1	R
1254	eae_1_1	F
1255	eae_1_1	R
1256	eltB_1_1	F
1257	eltB_1_1	R
1258	escR_1_1	F
1259	escR_1_1	R
1260	escT_1_1	F
1261	escT_1_1	R
1262	escU_1_1	F
1263	escU_1_1	R
1264	espB_1_1	F
1265	espB_1_1	R
1266	fes_1_1	F
1267	fes_1_1	R
1268	fes_2_1	F
1269	fes_2_1	R
1270	fteA_1_1	F
1271	fteA_1_1	R
1272	hlyA_1_1	F
1273	hlyA_1_1	R
1274	hlyB_1_1	F
1275	hlyB_1_1	R
1276	iucA_1_1	F
1277	iucA_1_1	R
1278	iucB_1_1	F
1279	iucB_1_1	R
1280	iucC_1_1	F
1281	iucC_1_1	R
1282	papG_1_1	F
1283	papG_1_1	R
1284	rfbE_1_1	F
1285	rfbE_1_1	R
1286	shuA_1_1	F
1287	shuA_1_1	R
1288	SLTII_1_1	F
1289	SLTII_1_1	R
1290	toxA-LTPA_1_1	F

SEQ ID NO	Probe name	Direction
1291	toxA-LTPA_1_1	R
1292	VT2vaB_1_1	F
1293	VT2vaB_1_1	R
1294	ardeSE0106_1_1	F
1295	ardeSE0106_1_1	R
1296	ardeSE0107_1_1	F
1297	ardeSE0107_1_1	R
1298	aroiSE0105_1_1	F
1299	aroiSE0105_1_1	R
1300	atIE_1_1	F
1301	atIE_1_1	R
1302	agrB_1_1	F
1303	agrB_1_1	R
1304	agrC_1_1	F
1305	agrC_1_1	R
1306	alphSE1368_1_1	F
1307	alphSE1368_1_1	R
1308	gad_1_1	F
1309	gad_1_1	R
1310	glucSE1191_1_1	F
1311	glucSE1191_1_1	R
1312	hsp10_1_1	F
1313	hsp10_1_1	R
1314	icaA_1_1	F
1315	icaA_1_1	R
1316	icaB_1_1	F
1317	icaB_1_1	R
1318	mvaSSepid_1_1	F
1319	mvaSSepid_1_1	R
1320	nitreSE1972_1_1	F
1321	nitreSE1972_1_1	R
1322	nitreSE1974_1_1	F
1323	nitreSE1974_1_1	R
1324	nitreSE1975_1_1	F
1325	nitreSE1975_1_1	R
1326	oiamtSE1209_1_1	F
1327	oiamtSE1209_1_1	R
1328	ORF1Sepid_1_1	F
1329	ORF1Sepid_1_1	R
1330	ORF3bSepid_1_1	F
1331	ORF3bSepid_1_1	R
1332	qacR_1_1	F
1333	qacR_1_1	R
1334	sin_1_1	F

SEQ ID NO	Probe name	Direction
1335	sin_1_1	R
1336	ureSE1861_1_1	F
1337	ureSE1861_1_1	R
1338	ureSE1863_1_1	F
1339	ureSE1863_1_1	R
1340	ureSE1864_1_1	F
1341	ureSE1864_1_1	R
1342	ureSE1865_1_1	F
1343	ureSE1865_1_1	R
1344	ureSE1867_1_1	F
1345	ureSE1867_1_1	R
1346	gcaD_1_1	F
1347	gcaD_1_1	R
1348	hld_orf5_1_1	F
1349	hld_orf5_1_1	R
1350	icaC_1_1	F
1351	icaC_1_1	R
1352	icaD_1_1	F
1353	icaD_1_1	R
1354	icaR_1_1	F
1355	icaR_1_1	R
1356	psm_beta1and2_1_1	F
1357	psm_beta1and2_1_1	R
1358	purR_1_1	F
1359	purR_1_1	R
1360	spoVG_1_1	F
1361	spoVG_1_1	R
1362	yabJ_1_1	F
1363	yabJ_1_1	R
1364	folQShaemolyt_1_1	F
1365	folQShaemolyt_1_1	R
1366	mvaCShaemolyticus_1_1	F
1367	mvaCShaemolyticus_1_1	R
1368	mvaDShaemolyt_1_1	F
1369	mvaDShaemolyt_1_1	R
1370	mvaK1Shaemolyticus_1_1	F
1371	mvaK1Shaemolyticus_1_1	R
1372	mvaSShaemolyticus_1_1	F
1373	mvaSShaemolyticus_1_1	R
1374	RNApolsigm_1_1	F
1375	RNApolsigm_1_1	R
1376	lipShaemolyt_1_1	F
1377	lipShaemolyt_1_1	R
1378	agrB2Stalugd_1_1	F

SEQ ID NO	Probe name	Direction
1379	agrB2Stalugd_1_1	R
1380	agrC2Stalugd_1_1	F
1381	agrC2Stalugd_1_1	R
1382	agrCStalugd_1_1	F
1383	agrCStalugd_1_1	R
1384	slamStalugd_1_1	F
1385	slamStalugd_1_1	R
1386	fblStalugd_1_1	F
1387	fblStalugd_1_1	R
1388	slushABCStalugd_1_1	F
1389	slushABCStalugd_1_1	R
1390	RNApolsigmSsapro_1_1	F
1391	RNApolsigmSsapro_1_1	R
1392	RNApolsigmSsapro_1_2	F
1393	RNApolsigmSsapro_1_2	R
1394	msrw1Stwar_1_1	F
1395	msrw1Stwar_1_1	R
1396	nukMStwar_1_1	F
1397	nukMStwar_1_1	R
1398	proDStwar_1_1	F
1399	proDStwar_1_1	R
1400	proMStwar_1_1	F
1401	proMStwar_1_1	R
1402	sigrpoStwar_1_1	F
1403	sigrpoStwar_1_1	R
1404	tnpStwar_1_1	F
1405	tnpStwar_1_1	R
1406	gehAStwar_1_1	F
1407	gehAStwar_1_1	R
1408	ARG56_1_1	F
1409	ARG56_1_1	R
1410	ASL43f_1_1	F
1411	ASL43f_1_1	R
1412	BGL2_1_1	F
1413	BGL2_1_1	R
1414	CACHS3_1_1	F
1415	CACHS3_1_1	R
1416	CCT8_1_1	F
1417	CCT8_1_1	R
1418	CDC37_1_1	F
1419	CDC37_1_1	R
1420	CEF3_1_1	F
1421	CEF3_1_1	R
1422	CHS1_1_1	F

SEQ ID NO	Probe name	Direction
1423	CHS1_1_1	R
1424	CHS2_1_1	F
1425	CHS2_1_1	R
1426	CHS4_1_1	F
1427	CHS4_1_1	R
1428	CHS5_1_1	F
1429	CHS5_1_1	R
1430	CHT1_1_1	F
1431	CHT1_1_1	R
1432	CHT2_1_1	F
1433	CHT2_1_1	R
1434	CHT4_1_1	F
1435	CHT4_1_1	R
1436	CSA1_1_1	F
1437	CSA1_1_1	R
1438	5triphosphatase_1_1	F
1439	5triphosphatase_1_1	R
1440	AAF1_1_1	F
1441	AAF1_1_1	R
1442	ADH1_1_1	F
1443	ADH1_1_1	R
1444	ALS1_1_1	F
1445	ALS1_1_1	R
1446	ALS7_1_1	F
1447	ALS7_1_1	R
1448	EDT1_1_1	F
1449	EDT1_1_1	R
1450	ELF_1_1	F
1451	ELF_1_1	R
1452	ESS1_1_1	F
1453	ESS1_1_1	R
1454	FAL1_1_1	F
1455	FAL1_1_1	R
1456	GAP1_1_1	F
1457	GAP1_1_1	R
1458	GNA1_1_1	F
1459	GNA1_1_1	R
1460	GSC1_1_1	F
1461	GSC1_1_1	R
1462	GSL1_1_1	F
1463	GSL1_1_1	R
1464	HIS1_1_1	F
1465	HIS1_1_1	R
1466	HTS1_1_1	F

SEQ ID NO	Probe name	Direction
1467	HTS1_1_1	R
1468	HWP1_2_1	F
1469	HWP1_2_1	R
1470	HYR1_1_1	F
1471	HYR1_1_1	R
1472	INT1a_1_1	F
1473	INT1a_1_1	R
1474	KRE15f_1_1	F
1475	KRE15f_1_1	R
1476	KRE6_1_1	F
1477	KRE6_1_1	R
1478	KRE9_1_1	F
1479	KRE9_1_1	R
1480	MIG1_1_1	F
1481	MIG1_1_1	R
1482	MLS1_1_1	F
1483	MLS1_1_1	R
1484	MP65_1_1	F
1485	MP65_1_1	R
1486	NDE1_1_1	F
1487	NDE1_1_1	R
1488	PFK2_1_1	F
1489	PFK2_1_1	R
1490	PHR1_1_1	F
1491	PHR1_1_1	R
1492	PHR2_1_1	F
1493	PHR2_1_1	R
1494	PHR3_1_1	F
1495	PHR3_1_1	R
1496	PRA1_1_1	F
1497	PRA1_1_1	R
1498	PRS1_1_1	F
1499	PRS1_1_1	R
1500	RBT1_1_1	F
1501	RBT1_1_1	R
1502	RBT4_1_1	F
1503	RBT4_1_1	R
1504	RHO1_1_1	F
1505	RHO1_1_1	R
1506	RNR1_1_1	F
1507	RNR1_1_1	R
1508	RPB7_1_1	F
1509	RPB7_1_1	R
1510	RPL13_1_1	F

SEQ ID NO	Probe name	Direction
1511	RPL13_1_1	R
1512	RVS167_1_1	F
1513	RVS167_1_1	R
1514	SHA3_1_1	F
1515	SHA3_1_1	R
1516	SKN1_1_1	F
1517	SKN1_1_1	R
1518	SRB1_1_1	F
1519	SRB1_1_1	R
1520	TCA1_1_1	F
1521	TCA1_1_1	R
1522	TRP1_1_1	F
1523	TRP1_1_1	R
1524	YAE1_1_1	F
1525	YAE1_1_1	R
1526	YRB1_1_1	F
1527	YRB1_1_1	R
1528	YST1exon2_1_1	F
1529	YST1exon2_1_1	R
1530	CCN1_1_1	F
1531	CCN1_1_1	R
1532	CDC28_1_1	F
1533	CDC28_1_1	R
1534	CLN2_1_1	F
1535	CLN2_1_1	R
1536	CPH1_1_1	F
1537	CPH1_1_1	R
1538	CYB1_1_1	F
1539	CYB1_1_1	R
1540	EFG1_1_1	F
1541	EFG1_1_1	R
1542	MNT1_1_1	F
1543	MNT1_1_1	R
1544	RBF1_1_1	F
1545	RBF1_1_1	R
1546	RBF1_2_1	F
1547	RBF1_2_1	R
1548	RIM101_1_1	F
1549	RIM101_1_1	R
1550	RIM8_1_1	F
1551	RIM8_1_1	R
1552	SEC14_1_1	F
1553	SEC14_1_1	R
1554	SEC4_1_1	F

SEQ ID NO	Probe name	Direction
1555	SEC4_1_1	R
1556	TUP1_1_1	F
1557	TUP1_1_1	R
1558	YPT1_1_1	F
1559	YPT1_1_1	R
1560	ZNF1CZF1_2_1	F
1561	ZNF1CZF1_2_1	R
1562	arcA_1_1	F
1563	arcA_1_1	R
1564	arcC_1_1	F
1565	arcC_1_1	R
1566	bkdA_1_1	F
1567	bkdA_1_1	R
1568	cad_1_1	F
1569	cad_1_1	R
1570	camE1_1_1	F
1571	camE1_1_1	R
1572	csrA_1_1	F
1573	csrA_1_1	R
1574	dacA_1_1	F
1575	dacA_1_1	R
1576	dfr_1_1	F
1577	dfr_1_1	R
1578	dhoD1a_1_1	F
1579	dhoD1a_1_1	R
1580	ABC-eltA_1_1	F
1581	ABC-eltA_1_1	R
1582	agrBfs_1_1	F
1583	agrBfs_1_1	R
1584	agrCfs_1_1	F
1585	agrCfs_1_1	R
1586	dnaE_1_1	F
1587	dnaE_1_1	R
1588	ebsA_1_1	F
1589	ebsA_1_1	R
1590	ebsB_1_1	F
1591	ebsB_1_1	R
1592	eep_1_1	F
1593	eep_1_1	R
1594	efaR_1_1	F
1595	efaR_1_1	R
1596	gls24_glsB_1_1	F
1597	gls24_glsB_1_1	R
1598	gph_1_1	F

SEQ ID NO	Probe name	Direction
1599	gph_1_1	R
1600	gyrAEf_1_1	F
1601	gyrAEf_1_1	R
1602	metEf_1_1	F
1603	metEf_1_1	R
1604	mntHCb2_1_1	F
1605	mntHCb2_1_1	R
1606	mob2_1_1	F
1607	mob2_1_1	R
1608	mvaD_1_1	F
1609	mvaD_1_1	R
1610	mvaE_1_1	F
1611	mvaE_1_1	R
1612	parC_1_1	F
1613	parC_1_1	R
1614	pcfG_1_1	F
1615	pcfG_1_1	R
1616	phoZ_1_1	F
1617	phoZ_1_1	R
1618	polC_1_1	F
1619	polC_1_1	R
1620	ptb_1_1	F
1621	ptb_1_1	R
1622	recS1_1_1	F
1623	recS1_1_1	R
1624	rpoN_1_1	F
1625	rpoN_1_1	R
1626	tms_1_1	F
1627	tms_1_1	R
1628	tyrDC_1_1	F
1629	tyrDC_1_1	R
1630	tyrS_1_1	F
1631	tyrS_1_1	R
1632	asa1_1_1	F
1633	asa1_1_1	R
1634	asp1_1_1	F
1635	asp1_1_1	R
1636	cgh_1_1	F
1637	cgh_1_1	R
1638	cylA_1_1	F
1639	cylA_1_1	R
1640	cylB_1_1	F
1641	cylB_1_1	R
1642	cylI_1_1	F

SEQ ID NO	Probe name	Direction
1643	cylI_1_1	R
1644	cylL_cylS_1_1	F
1645	cylL_cylS_1_1	R
1646	cylM_1_1	F
1647	cylM_1_1	R
1648	ace_1_1	F
1649	ace_1_1	R
1650	ef00108_1_1	F
1651	ef00108_1_1	R
1652	ef00109_1_1	F
1653	ef00109_1_1	R
1654	ef0011_1_1	F
1655	ef0011_1_1	R
1656	ef00113_1_1	F
1657	ef00113_1_1	R
1658	ef0012_1_1	F
1659	ef0012_1_1	R
1660	ef0022_1_1	F
1661	ef0022_1_1	R
1662	ef0031_1_1	F
1663	ef0031_1_1	R
1664	ef0032_1_1	F
1665	ef0032_1_1	R
1666	ef0040_1_1	F
1667	ef0040_1_1	R
1668	ef0058_1_1	F
1669	ef0058_1_1	R
1670	enlA_1_1	F
1671	enlA_1_1	R
1672	esa_1_1	F
1673	esa_1_1	R
1674	esp_1_1	F
1675	esp_1_1	R
1676	gelE_1_1	F
1677	gelE_1_1	R
1678	groEL_1_1	F
1679	groEL_1_1	R
1680	groES_1_1	F
1681	groES_1_1	R
1682	rt1_1_1	F
1683	rt1_1_1	R
1684	sala_1_1	F
1685	sala_1_1	R
1686	salb_1_1	F

SEQ ID NO	Probe name	Direction
1687	salb_1_1	R
1688	sea1_1_1	F
1689	sea1_1_1	R
1690	sep1_1_1	F
1691	sep1_1_1	R
1692	vicK_1_1	F
1693	vicK_1_1	R
1694	yycH_1_1	F
1695	yycH_1_1	R
1696	yycI_1_1	F
1697	yycI_1_1	R
1698	yycJ_1_1	F
1699	yycJ_1_1	R
1700	bglB_1_1	F
1701	bglB_1_1	R
1702	bglR_1_1	F
1703	bglR_1_1	R
1704	bglS_1_1	F
1705	bglS_1_1	R
1706	efmA_1_1	F
1707	efmA_1_1	R
1708	efmB_1_1	F
1709	efmB_1_1	R
1710	efmC_1_1	F
1711	efmC_1_1	R
1712	mreC_1_1	F
1713	mreC_1_1	R
1714	mreD_1_1	F
1715	mreD_1_1	R
1716	mvaDEfaecium_1_1	F
1717	mvaDEfaecium_1_1	R
1718	mvaEEfaecium_1_1	F
1719	mvaEEfaecium_1_1	R
1720	mvaK1Efaecium_1_1	F
1721	mvaK1Efaecium_1_1	R
1722	mvaK2Efaecium_1_1	F
1723	mvaK2Efaecium_1_1	R
1724	mvaSEfaecium_1_1	F
1725	mvaSEfaecium_1_1	R
1726	orf3_4Efaeciumb_1_1	F
1727	orf3_4Efaeciumb_1_1	R
1728	orf6_7Efaecium_1_1	F
1729	orf6_7Efaecium_1_1	R
1730	orf7_8Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
1731	orf7_8Efaecium_1_1	R
1732	orf9_10Efaecium_1_1	F
1733	orf9_10Efaecium_1_1	R
1734	entA_entI_1_1	F
1735	entA_entI_1_1	R
1736	entD_1_1	F
1737	entD_1_1	R
1738	entR_1_1	F
1739	entR_1_1	R
1740	oep_1_1	F
1741	oep_1_1	R
1742	sagA_1_2	F
1743	sagA_1_2	R
1744	atsA_1_1	F
1745	atsA_1_1	R
1746	atsB_1_1	F
1747	atsB_1_1	R
1748	budC_1_1	F
1749	budC_1_1	R
1750	citA_1_1	F
1751	citA_1_1	R
1752	citW_1_1	F
1753	citW_1_1	R
1754	citX_1_1	F
1755	citX_1_1	R
1756	dalD_1_1	F
1757	dalD_1_1	R
1758	dalk_1_1	F
1759	dalk_1_1	R
1760	dalT_1_1	F
1761	dalT_1_1	R
1762	acoA_1_1	F
1763	acoA_1_1	R
1764	acoB_1_1	F
1765	acoB_1_1	R
1766	acoC_1_1	F
1767	acoC_1_1	R
1768	ahlK_1_1	F
1769	ahlK_1_1	R
1770	fimK_1_1	F
1771	fimK_1_1	R
1772	glfKPN2_1_1	F
1773	glfKPN2_1_1	R
1774	ltrA_1_1	F

SEQ ID NO	Probe name	Direction
1775	ltrA_1_1	R
1776	mdcC_1_1	F
1777	mdcC_1_1	R
1778	mdcF_1_1	F
1779	mdcF_1_1	R
1780	mdcH_1_1	F
1781	mdcH_1_1	R
1782	mrkA_1_1	F
1783	mrkA_1_1	R
1784	mtrK_1_1	F
1785	mtrK_1_1	R
1786	nifF_1_1	F
1787	nifF_1_1	R
1788	nifK_1_1	F
1789	nifK_1_1	R
1790	nifN_1_1	F
1791	nifN_1_1	R
1792	tyrP_1_1	F
1793	tyrP_1_1	R
1794	ureA_1_1	F
1795	ureA_1_1	R
1796	wbbO_1_1	F
1797	wbbO_1_1	R
1798	wza_1_1	F
1799	wza_1_1	R
1800	wzb_1_1	F
1801	wzb_1_1	R
1802	wzmKPN2_1_1	F
1803	wzmKPN2_1_1	R
1804	wztKPN2_1_1	F
1805	wztKPN2_1_1	R
1806	yojH_1_1	F
1807	yojH_1_1	R
1808	liac_1_1	F
1809	liac_1_1	R
1810	cim_1_1	F
1811	cim_1_1	R
1812	aldA_1_1	F
1813	aldA_1_1	R
1814	aldA_2_1	F
1815	aldA_2_1	R
1816	hemly_1_1	F
1817	hemly_1_1	R
1818	pSL017_1_1	F

SEQ ID NO	Probe name	Direction
1819	pSL017_1_1	R
1820	pSL020_1_1	F
1821	pSL020_1_1	R
1822	rcaA_1_1	F
1823	rcaA_1_1	R
1824	rmlC_1_1	F
1825	rmlC_1_1	R
1826	rmlD_1_1	F
1827	rmlD_1_1	R
1828	waaG_1_1	F
1829	waaG_1_1	R
1830	wbbD_1_1	F
1831	wbbD_1_1	R
1832	wbbM_1_1	F
1833	wbbM_1_1	R
1834	wbbN_1_1	F
1835	wbbN_1_1	R
1836	wbdA_1_1	F
1837	wbdA_1_1	R
1838	wbdC_1_1	F
1839	wbdC_1_1	R
1840	wztKpn_1_1	F
1841	wztKpn_1_1	R
1842	yibD_1_1	F
1843	yibD_1_1	R
1844	cymA_1_1	F
1845	cymA_1_1	R
1846	cymD_1_1	F
1847	cymD_1_1	R
1848	cymE_1_1	F
1849	cymE_1_1	R
1850	cymH_1_1	F
1851	cymH_1_1	R
1852	cymI_1_1	F
1853	cymI_1_1	R
1854	cymJ_1_1	F
1855	cymJ_1_1	R
1856	ddrA_1_1	F
1857	ddrA_1_1	R
1858	fdt-1_1_1	F
1859	fdt-1_1_1	R
1860	fdt-2_1_1	F
1861	fdt-2_1_1	R
1862	fdt-3_1_1	F

SEQ ID NO	Probe name	Direction
1863	fdt-3_1_1	R
1864	gatY_1_1	F
1865	gatY_1_1	R
1866	hydH_1_1	F
1867	hydH_1_1	R
1868	masA_1_1	F
1869	masA_1_1	R
1870	nasA_1_1	F
1871	nasA_1_1	R
1872	nasE_1_1	F
1873	nasE_1_1	R
1874	nasF_1_1	F
1875	nasF_1_1	R
1876	pehX_1_1	F
1877	pehX_1_1	R
1878	pelX_1_1	F
1879	pelX_1_1	R
1880	tagH_1_1	F
1881	tagH_1_1	R
1882	tagK_1_1	F
1883	tagK_1_1	R
1884	tagT_1_1	F
1885	tagT_1_1	R
1886	glpR_1_1	F
1887	glpR_1_1	R
1888	lasRb_1_1	F
1889	lasRb_1_1	R
1890	OrfX_1_1	F
1891	OrfX_1_1	R
1892	pa0260_1_1	F
1893	pa0260_1_1	R
1894	pa0572_1_1	F
1895	pa0572_1_1	R
1896	pa0625_1_1	F
1897	pa0625_1_1	R
1898	pa0636_1_1	F
1899	pa0636_1_1	R
1900	pa1046_1_1	F
1901	pa1046_1_1	R
1902	pa1069_1_1	F
1903	pa1069_1_1	R
1904	pa1846_1_1	F
1905	pa1846_1_1	R
1906	pa3866_1_1	F

SEQ ID NO	Probe name	Direction
1907	pa3866_1_1	R
1908	pa4082_1_1	F
1909	pa4082_1_1	R
1910	pilAp_1_1	F
1911	pilAp_1_1	R
1912	PilAp2_1_1	F
1913	PilAp2_1_1	R
1914	pilC_1_1	F
1915	pilC_1_1	R
1916	PstP_1_1	F
1917	PstP_1_1	R
1918	purK_1_1	F
1919	purK_1_1	R
1920	uvrDII_1_1	F
1921	uvrDII_1_1	R
1922	vsmI_1_1	F
1923	vsmI_1_1	R
1924	vsmR_1_2	F
1925	vsmR_1_2	R
1926	xcpX_1_1	F
1927	xcpX_1_1	R
1928	aprA_1_1	F
1929	aprA_1_1	R
1930	aprE_1_1	F
1931	aprE_1_1	R
1932	ctx_1_2	F
1933	ctx_1_2	R
1934	algB_1_1	F
1935	algB_1_1	R
1936	algN_1_1	F
1937	algN_1_1	R
1938	algR_1_1	F
1939	algR_1_1	R
1940	ExoS_1_1	F
1941	ExoS_1_1	R
1942	fpvA_1_1	F
1943	fpvA_1_1	R
1944	lasRa_1_1	F
1945	lasRa_1_1	R
1946	lipA_1_1	F
1947	lipA_1_1	R
1948	lipH_1_1	F
1949	lipH_1_1	R
1950	Orf159_1_2	F

SEQ ID NO	Probe name	Direction
1951	Orf159_1_2	R
1952	Orf252_1_1	F
1953	Orf252_1_1	R
1954	pchG_1_1	F
1955	pchG_1_1	R
1956	PhzA_1_1	F
1957	PhzA_1_1	R
1958	PhzB_1_1	F
1959	PhzB_1_1	R
1960	PLC_1_1	F
1961	PLC_1_1	R
1962	plcN_1_1	F
1963	plcN_1_1	R
1964	plcR_1_1	F
1965	plcR_1_1	R
1966	pvdD_1_1	F
1967	pvdD_1_1	R
1968	pvdF_1_2	F
1969	pvdF_1_2	R
1970	pyocinS1_1_1	F
1971	pyocinS1_1_1	R
1972	pyocinS1im_1_1	F
1973	pyocinS1im_1_1	R
1974	pyocinS2_1_1	F
1975	pyocinS2_1_1	R
1976	pys2_1_1	F
1977	pys2_1_1	R
1978	pys2_2_1	F
1979	pys2_2_1	R
1980	rbf303_1_1	F
1981	rbf303_1_1	R
1982	rhIA_1_1	F
1983	rhIA_1_1	R
1984	rhIB_1_1	F
1985	rhIB_1_1	R
1986	rhIR_1_1	F
1987	rhIR_1_1	R
1988	TnAP41_1_2	F
1989	TnAP41_1_2	R
1990	toxA_1_1	F
1991	toxA_1_1	R
1992	cap1EStrpneu_1_1	F
1993	cap1EStrpneu_1_1	R
1994	cap1FStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
1995	cap1FStrpneu_1_1	R
1996	cap1GStrpneu_1_1	F
1997	cap1GStrpneu_1_1	R
1998	cap3AStrpneu_1_1	F
1999	cap3AStrpneu_1_1	R
2000	cap3BStrpneu_1_1	F
2001	cap3BStrpneu_1_1	R
2002	celAStrpneu_1_1	F
2003	celAStrpneu_1_1	R
2004	celBStrpneu_1_1	F
2005	celBStrpneu_1_1	R
2006	cglAStrpneu_1_1	F
2007	cglAStrpneu_1_1	R
2008	cglBStrpneu_1_1	F
2009	cglBStrpneu_1_1	R
2010	cglCStrpneu_1_1	F
2011	cglCStrpneu_1_1	R
2012	cglDStrpneu_1_1	F
2013	cglDStrpneu_1_1	R
2014	cinA_1_1	F
2015	cinA_1_1	R
2016	cps14EStrpneum_1_1	F
2017	cps14EStrpneum_1_1	R
2018	cps14FStrpneum_1_1	F
2019	cps14FStrpneum_1_1	R
2020	cps14GStrpneum_1_1	F
2021	cps14GStrpneum_1_1	R
2022	cps14HStrpneum_1_1	F
2023	cps14HStrpneum_1_1	R
2024	cps19aHStrpneum_1_1	F
2025	cps19aHStrpneum_1_1	R
2026	cps19aIStrpneum_1_1	F
2027	cps19aIStrpneum_1_1	R
2028	cps19aKStrpneum_1_1	F
2029	cps19aKStrpneum_1_1	R
2030	cps19fGStrpneum_1_1	F
2031	cps19fGStrpneum_1_1	R
2032	cps23fGStrpneum_1_1	F
2033	cps23fGStrpneum_1_1	R
2034	dexB_1_1	F
2035	dexB_1_1	R
2036	dinF_1_1	F
2037	dinF_1_1	R
2038	1760Strpneu_1_1	F

SEQ ID NO	Probe name	Direction
2039	1760Strpneu_1_1	R
2040	acyPStrpneu_1_1	F
2041	acyPStrpneu_1_1	R
2042	endAStrpneu_1_1	F
2043	endAStrpneu_1_1	R
2044	exoAStrpneu_1_1	F
2045	exoAStrpneu_1_1	R
2046	exp72_1_1	F
2047	exp72_1_1	R
2048	fnlAStrpneu_1_1	F
2049	fnlAStrpneu_1_1	R
2050	fnlBStrpneu_1_1	F
2051	fnlBStrpneu_1_1	R
2052	fnlCStrpneu_1_1	F
2053	fnlCStrpneu_1_1	R
2054	gct18Strpneum_1_1	F
2055	gct18Strpneum_1_1	R
2056	hexB1_1_1	F
2057	hexB1_1_1	R
2058	hftsHstrpneu_1_1	F
2059	hftsHstrpneu_1_1	R
2060	immunofrag1Strpneu_1_1	F
2061	immunofrag1Strpneu_1_1	R
2062	immunofrag2Strpneu_2_1	F
2063	immunofrag2Strpneu_2_1	R
2064	immunofrag3Strpneu_2_1	F
2065	immunofrag3Strpneu_2_1	R
2066	kdtBStrpneu_1_1	F
2067	kdtBStrpneu_1_1	R
2068	lysAStrpneu_1_1	F
2069	lysAStrpneu_1_1	R
2070	pcpBStrpneu_1_1	F
2071	pcpBStrpneu_1_1	R
2072	pflCStrpneu_1_1	F
2073	pflCStrpneu_1_1	R
2074	plpA_1_1	F
2075	plpA_1_1	R
2076	prtA1Strpneu_1_1	F
2077	prtA1Strpneu_1_1	R
2078	pspC1Strpneu_1_1	F
2079	pspC1Strpneu_1_1	R
2080	pspC2_1_1	F
2081	pspC2_1_1	R
2082	purRStrpneu_1_1	F

SEQ ID NO	Probe name	Direction
2083	purRStrpneu_1_1	R
2084	pyrDAStrpneum_1_1	F
2085	pyrDAStrpneum_1_1	R
2086	SP0828Strpneu_1_1	F
2087	SP0828Strpneu_1_1	R
2088	SP0830Strpneu_1_1	F
2089	SP0830Strpneu_1_1	R
2090	SP0833Strpneu_1_1	F
2091	SP0833Strpneu_1_1	R
2092	SP0837_38Strpneu_1_1	F
2093	SP0837_38Strpneu_1_1	R
2094	SP0839Strpneu_1_1	F
2095	SP0839Strpneu_1_1	R
2096	ugdStrpneu_1_1	F
2097	ugdStrpneu_1_1	R
2098	uncC_1_1	F
2099	uncC_1_1	R
2100	vicXStrepneu_1_1	F
2101	vicXStrepneu_1_1	R
2102	wchA6bStrpneum_1_1	F
2103	wchA6bStrpneum_1_1	R
2104	wci4Strpneum_1_1	F
2105	wci4Strpneum_1_1	R
2106	wciK4Strpneum_1_1	F
2107	wciK4Strpneum_1_1	R
2108	wciL4Strpneum_1_1	F
2109	wciL4Strpneum_1_1	R
2110	wciN6bStrpneum_1_1	F
2111	wciN6bStrpneum_1_1	R
2112	wciO6bStrpneum_1_1	F
2113	wciO6bStrpneum_1_1	R
2114	wciP6bStrpneum_1_1	F
2115	wciP6bStrpneum_1_1	R
2116	wciY18Strpneum_1_1	F
2117	wciY18Strpneum_1_1	R
2118	wzdbStrpneum_1_1	F
2119	wzdbStrpneum_1_1	R
2120	wze6bStrpneum_1_1	F
2121	wze6bStrpneum_1_1	R
2122	wzy18Strpneum_1_1	F
2123	wzy18Strpneum_1_1	R
2124	wzy4Strpneum_1_1	F
2125	wzy4Strpneum_1_1	R
2126	wzy6bStrpneum_1_1	F

SEQ ID NO	Probe name	Direction
2127	wzy6bStrpneum_1_1	R
2128	xpt_1_1	F
2129	xpt_1_1	R
2130	igaStrpneu_1_1	F
2131	igaStrpneu_1_1	R
2132	lytA_1_1	F
2133	lytA_1_1	R
2134	nanA_1_1	F
2135	nanA_1_1	R
2136	nanBStrpneu_1_1	F
2137	nanBStrpneu_1_1	R
2138	pcpCStrpneu_1_1	F
2139	pcpCStrpneu_1_1	R
2140	ply_1_1	F
2141	ply_1_1	R
2142	prtAStrpneu_1_1	F
2143	prtAStrpneu_1_1	R
2144	pspA_1_2	F
2145	pspA_1_2	R
2146	SP0834Strpneu_1_1	F
2147	SP0834Strpneu_1_1	R
2148	SP0834Strpneu_1_2	F
2149	SP0834Strpneu_1_2	R
2150	sphtraStrpneu_1_1	F
2151	sphtraStrpneu_1_1	R
2152	wciJStrpneu_1_1	F
2153	wciJStrpneu_1_1	R
2154	wziyStrpneu_1_1	F
2155	wziyStrpneu_1_1	R
2156	wzxStrpneu_1_1	F
2157	wzxStrpneu_1_1	R
2158	cpsA1Strgal_1_1	F
2159	cpsA1Strgal_1_1	R
2160	cpsB1Strgal_1_1	F
2161	cpsB1Strgal_1_1	R
2162	cpsC1Strgal_1_1	F
2163	cpsC1Strgal_1_1	R
2164	cpsD1Strgal_1_1	F
2165	cpsD1Strgal_1_1	R
2166	cpsE1Strgal_1_1	F
2167	cpsE1Strgal_1_1	R
2168	cpsG1Strgal_1_1	F
2169	cpsG1Strgal_1_1	R
2170	cpsIStragal_1_1	F

SEQ ID NO	Probe name	Direction
2171	cpsIStragal_1_1	R
2172	cpsJStragal_1_1	F
2173	cpsJStragal_1_1	R
2174	cpsKStragal_1_1	F
2175	cpsKStragal_1_1	R
2176	cpsMStragal_1_1	F
2177	cpsMStragal_1_1	R
2178	cpsYStragal_1_1	F
2179	cpsYStragal_1_1	R
2180	cpsYStragal_2_1	F
2181	cpsYStragal_2_1	R
2182	cylBStraga_1_1	F
2183	cylBStraga_1_1	R
2184	cylEStraga_1_1	F
2185	cylEStraga_1_1	R
2186	cylFStraga_1_1	F
2187	cylFStraga_1_1	R
2188	cylHStraga_1_1	F
2189	cylHStraga_1_1	R
2190	cylIStraga_1_1	F
2191	cylIStraga_1_1	R
2192	cylJStraga_1_1	F
2193	cylJStraga_1_1	R
2194	cylKStraga_1_1	F
2195	cylKStraga_1_1	R
2196	0487Straga_1_1	F
2197	0487Straga_1_1	R
2198	0488Straga_1_1	F
2199	0488Straga_1_1	R
2200	0493Straga_1_1	F
2201	0493Straga_1_1	R
2202	0495Straga_1_1	F
2203	0495Straga_1_1	R
2204	0498Straga_1_1	F
2205	0498Straga_1_1	R
2206	0500Straga_1_1	F
2207	0500Straga_1_1	R
2208	0502Straga_1_1	F
2209	0502Straga_1_1	R
2210	0504Straga_1_1	F
2211	0504Straga_1_1	R
2212	foldStraga_1_1	F
2213	foldStraga_1_1	R
2214	neuA1Strgal_1_1	F

SEQ ID NO	Probe name	Direction
2215	neuA1Strgal_1_1	R
2216	neuB1Strgal_1_1	F
2217	neuB1Strgal_1_1	R
2218	neuC1Strgal_1_1	F
2219	neuC1Strgal_1_1	R
2220	neuD1Strgal_1_1	F
2221	neuD1Strgal_1_1	R
2222	recNStraga_1_1	F
2223	recNStraga_1_1	R
2224	ileSStraga_1_1	F
2225	ileSStraga_1_1	R
2226	CAMPfactor_1_1	F
2227	CAMPfactor_1_1	R
2228	CAMPfactor_2_1	F
2229	CAMPfactor_2_1	R
2230	0499Straga_1_1	F
2231	0499Straga_1_1	R
2232	hylStragal_1_1	F
2233	hylStragal_1_1	R
2234	lipStragal_1_1	F
2235	lipStragal_1_1	R
2236	cyclStrpyog_1_1	F
2237	cyclStrpyog_1_1	R
2238	fah_rph_hlo_Strpyog_1_1	F
2239	fah_rph_hlo_Strpyog_1_1	R
2240	int_1_1	F
2241	int_1_1	R
2242	int315.5_1_1	F
2243	int315.5_1_1	R
2244	murEStrpyog_1_1	F
2245	murEStrpyog_1_1	R
2246	oppA_1_1	F
2247	oppA_1_1	R
2248	oppCStrpyog_1_1	F
2249	oppCStrpyog_1_1	R
2250	oppD_1_1	F
2251	oppD_1_1	R
2252	SPy0382Strpyog_1_1	F
2253	SPy0382Strpyog_1_1	R
2254	SPy0390Strpyog_1_1	F
2255	SPy0390Strpyog_1_1	R
2256	SpyM3_1351_1_1	F
2257	SpyM3_1351_1_1	R
2258	vicXStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2259	vicXStrpyog_1_1	R
2260	DNaseIStrpyog_1_1	F
2261	DNaseIStrpyog_1_1	R
2262	fba2Strpyog_1_1	F
2263	fba2Strpyog_1_1	R
2264	fhuAStrpyog_1_1	F
2265	fhuAStrpyog_1_1	R
2266	fhuB1Strpyog_1_1	F
2267	fhuB1Strpyog_1_1	R
2268	fhuDStrpyog_1_1	F
2269	fhuDStrpyog_1_1	R
2270	fhuGStrpyog_1_1	F
2271	fhuGStrpyog_1_1	R
2272	hylA_1_1	F
2273	hylA_1_1	R
2274	hylP_1_1	F
2275	hylP_1_1	R
2276	hylp2_1_1	F
2277	hylp2_1_1	R
2278	oppB_1_1	F
2279	oppB_1_1	R
2280	ropB_1_1	F
2281	ropB_1_1	R
2282	scpAStrpyog_1_1	F
2283	scpAStrpyog_1_1	R
2284	sloStrpyog_1_1	F
2285	sloStrpyog_1_1	R
2286	smez-4Strpyog_1_1	F
2287	smez-4Strpyog_1_1	R
2288	sof_1_1	F
2289	sof_1_1	R
2290	sof_2_1	F
2291	sof_2_1	R
2292	speA_1_1	F
2293	speA_1_1	R
2294	speB2Strpyog_1_1	F
2295	speB2Strpyog_1_1	R
2296	speCStrpyog_1_1	F
2297	speCStrpyog_1_1	R
2298	speJStrpyog_1_1	F
2299	speJStrpyog_1_1	R
2300	srtBStrpyog_1_1	F
2301	srtBStrpyog_1_1	R
2302	srtCStrpyog_1_1	F

SEQ ID NO	Probe name	Direction
2303	srtCStrpyog_1_1	R
2304	srtEStrpyog_1_1	F
2305	srtEStrpyog_1_1	R
2306	srtFStrpyog_1_1	F
2307	srtFStrpyog_1_1	R
2308	srtGStrpyog_1_1	F
2309	srtGStrpyog_1_1	R
2310	srtIStrpyog_1_1	F
2311	srtIStrpyog_1_1	R
2312	srtKStrpyog_1_1	F
2313	srtKStrpyog_1_1	R
2314	srtRStrpyog_1_1	F
2315	srtRStrpyog_1_1	R
2316	srtTStrpyog_1_1	F
2317	srtTStrpyog_1_1	R
2318	vicKStrpyog_1_1	F
2319	vicKStrpyog_1_1	R
2320	573Stprmut_1_1	F
2321	573Stprmut_1_1	R
2322	580SStprmut_1_1	F
2323	580SStprmut_1_1	R
2324	581_582SStprmut_1_1	F
2325	581_582SStprmut_1_1	R
2326	584SStprmut_1_1	F
2327	584SStprmut_1_1	R
2328	dltAStrmut_1_1	F
2329	dltAStrmut_1_1	R
2330	dltBStrmut_1_1	F
2331	dltBStrmut_1_1	R
2332	dltCpx1Strmut_1_1	F
2333	dltCpx1Strmut_1_1	R
2334	dltDStrmut_1_1	F
2335	dltDStrmut_1_1	R
2336	lichStrbov_1_1	F
2337	lichStrbov_1_1	R
2338	lytRStprmut_1_1	F
2339	lytRStprmut_1_1	R
2340	lytSStprmut_1_1	F
2341	lytSStprmut_1_1	R
2342	pepQStrrmut_1_1	F
2343	pepQStrrmut_1_1	R
2344	pflCStrmut_1_1	F
2345	pflCStrmut_1_1	R
2346	recNStprmut_1_1	F

SEQ ID NO	Probe name	Direction
2347	recNStprmut_1_1	R
2348	ytqBStrmut_1_1	F
2349	ytqBStrmut_1_1	R
2350	hlyXStrmut_1_1	F
2351	hlyXStrmut_1_1	R
2352	igaStrmitis_1_1	F
2353	igaStrmitis_1_1	R
2354	igaStrsanguis_1_1	F
2355	igaStrsanguis_1_1	R
2356	perMStrmut_1_1	F
2357	perMStrmut_1_1	R
2358	atfA_1_1	F
2359	atfA_1_1	R
2360	atfB_1_1	F
2361	atfB_1_1	R
2362	atfC_1_1	F
2363	atfC_1_1	R
2364	ccmPrmi1_1_1	F
2365	ccmPrmi1_1_1	R
2366	cyaPrmi_1_1	F
2367	cyaPrmi_1_1	R
2368	aad_1_1	F
2369	aad_1_1	R
2370	flfB_1_1	F
2371	flfB_1_1	R
2372	flfD_1_1	F
2373	flfD_1_1	R
2374	flfN_1_1	F
2375	flfN_1_1	R
2376	flhD_1_1	F
2377	flhD_1_1	R
2378	floA_1_1	F
2379	floA_1_1	R
2380	ftsK_1_1	F
2381	ftsK_1_1	R
2382	gstB_1_1	F
2383	gstB_1_1	R
2384	hemCPrmi_1_1	F
2385	hemCPrmi_1_1	R
2386	hemDPrmi_1_1	F
2387	hemDPrmi_1_1	R
2388	hev_1_1	F
2389	hev_1_1	R
2390	katA_1_1	F

SEQ ID NO	Probe name	Direction
2391	katA_1_1	R
2392	lpp1_1_1	F
2393	lpp1_1_1	R
2394	menE_1_1	F
2395	menE_1_1	R
2396	mfd_1_1	F
2397	mfd_1_1	R
2398	nrpA_1_1	F
2399	nrpA_1_1	R
2400	nrpB_1_1	F
2401	nrpB_1_1	R
2402	nrpG_1_1	F
2403	nrpG_1_1	R
2404	nrpS_1_1	F
2405	nrpS_1_1	R
2406	nrpT_1_1	F
2407	nrpT_1_1	R
2408	nrpU_1_1	F
2409	nrpU_1_1	R
2410	pat_1_1	F
2411	pat_1_1	R
2412	pmfA_1_1	F
2413	pmfA_1_1	R
2414	pmfC_1_1	F
2415	pmfC_1_1	R
2416	pmfE_1_1	F
2417	pmfE_1_1	R
2418	ppaA_1_1	F
2419	ppaA_1_1	R
2420	rsbA_1_1	F
2421	rsbA_1_1	R
2422	rsbC_1_1	F
2423	rsbC_1_1	R
2424	speB_1_1	F
2425	speB_1_1	R
2426	stmA_1_1	F
2427	stmA_1_1	R
2428	stmB_1_1	F
2429	stmB_1_1	R
2430	terA_1_1	F
2431	terA_1_1	R
2432	terD_1_1	F
2433	terD_1_1	R
2434	umoA_1_1	F

SEQ ID NO	Probe name	Direction
2435	umoA_1_1	R
2436	umoB_1_1	F
2437	umoB_1_1	R
2438	umoC_1_1	F
2439	umoC_1_1	R
2440	ureR_1_1	F
2441	ureR_1_1	R
2442	xerC_1_1	F
2443	xerC_1_1	R
2444	ygbA_1_1	F
2445	ygbA_1_1	R
2446	flaA_1_1	F
2447	flaA_1_1	R
2448	flaD_1_1	F
2449	flaD_1_1	R
2450	fliA_1_1	F
2451	fliA_1_1	R
2452	hpmA_1_1	F
2453	hpmA_1_1	R
2454	hpmB_1_1	F
2455	hpmB_1_1	R
2456	lpsPrmi_1_1	F
2457	lpsPrmi_1_1	R
2458	mrpA_1_1	F
2459	mrpA_1_1	R
2460	mrpB_1_1	F
2461	mrpB_1_1	R
2462	mrpC_1_1	F
2463	mrpC_1_1	R
2464	mrpD_1_1	F
2465	mrpD_1_1	R
2466	mrpE_1_1	F
2467	mrpE_1_1	R
2468	mrpF_1_1	F
2469	mrpF_1_1	R
2470	mrpG_1_1	F
2471	mrpG_1_1	R
2472	mrpH_1_1	F
2473	mrpH_1_1	R
2474	mrpI_1_1	F
2475	mrpI_1_1	R
2476	mrpJ_1_1	F
2477	mrpJ_1_1	R
2478	patA_1_1	F

SEQ ID NO	Probe name	Direction
2479	patA_1_1	R
2480	putA_1_1	F
2481	putA_1_1	R
2482	uca_1_1	F
2483	uca_1_1	R
2484	ureDPrmi_1_1	F
2485	ureDPrmi_1_1	R
2486	ureEPrmi_1_1	F
2487	ureEPrmi_1_1	R
2488	ureFPrmi_1_1	F
2489	ureFPrmi_1_1	R
2490	zapA_1_1	F
2491	zapA_1_1	R
2492	zapB_1_1	F
2493	zapB_1_1	R
2494	zapD_1_1	F
2495	zapD_1_1	R
2496	zapE_1_1	F
2497	zapE_1_1	R
2498	envZPrvu_1_1	F
2499	envZPrvu_1_1	R
2500	frdC_1_1	F
2501	frdC_1_1	R
2502	frdD_1_1	F
2503	frdD_1_1	R
2504	infBPrvu_1_1	F
2505	infBPrvu_1_1	R
2506	lad_1_1	F
2507	lad_1_1	R
2508	tna2_1_1	F
2509	tna2_1_1	R
2510	end_1_1	F
2511	end_1_1	R
2512	pqrA_1_1	F
2513	pqrA_1_1	R
2514	urg_1_1	F
2515	urg_1_1	R
2516	blaIMP-7_1_1	F
2517	blaIMP-7_1_1	R
2518	mecISepid_1_1	F
2519	mecISepid_1_1	R
2520	blaOXA-10_1_2	F
2521	blaOXA-10_1_2	R
2522	blaB_1_1	F

SEQ ID NO	Probe name	Direction
2523	blaB_1_1	R
2524	ampC_1_1	F
2525	ampC_1_1	R
2526	I-blaR_1_1	F
2527	I-blaR_1_1	R
2528	blaOXA-32_1_1	F
2529	blaOXA-32_1_1	R
2530	bla-CTX-M-22_1_1	F
2531	bla-CTX-M-22_1_1	R
2532	pbp2aStrpneu_1_1	F
2533	pbp2aStrpneu_1_1	R
2534	blaSHV-1_1_1	F
2535	blaSHV-1_1_1	R
2536	blaOXA-2_1_1	F
2537	blaOXA-2_1_1	R
2538	blaRShaemolyt_1_1	F
2539	blaRShaemolyt_1_1	R
2540	blaIMP-7_1_2	F
2541	blaIMP-7_1_2	R
2542	I-mecR_1_1	F
2543	I-mecR_1_1	R
2544	blaOXY_1_1	F
2545	blaOXY_1_1	R
2546	dacCStrpyog_1_1	F
2547	dacCStrpyog_1_1	R
2548	femA_1_1	F
2549	femA_1_1	R
2550	mecA_1_1	F
2551	mecA_1_1	R
2552	blaIShaemolyt_1_1	F
2553	blaIShaemolyt_1_1	R
2554	blavim_1_1	F
2555	blavim_1_1	R
2556	pbp2b_1_1	F
2557	pbp2b_1_1	R
2558	pbp2primeSepid_1_1	F
2559	pbp2primeSepid_1_1	R
2560	pbp2x_1_1	F
2561	pbp2x_1_1	R
2562	pbp3Saureuc_1_1	F
2563	pbp3Saureuc_1_1	R
2564	pbp4_1_1	F
2565	pbp4_1_1	R
2566	pbp5Efaecium_1_1	F

SEQ ID NO	Probe name	Direction
2567	pbp5Efaecium_1_1	R
2568	pbpC_1_1	F
2569	pbpC_1_1	R
2570	I-mecI_1_1	F
2571	I-mecI_1_1	R
2572	pbp1a_1_1	F
2573	pbp1a_1_1	R
2574	I-blaI_1_1	F
2575	I-blaI_1_1	R
2576	blaTEM-106_1_1	F
2577	blaTEM-106_1_1	R
2578	blaOXY-KLOX_1_1	F
2579	blaOXY-KLOX_1_1	R
2580	ftsWEF_1_1	F
2581	ftsWEF_1_1	R
2582	fmhB_1_1	F
2583	fmhB_1_1	R
2584	cumA_1_1	F
2585	cumA_1_1	R
2586	femBShaemolyt_1_1	F
2587	femBShaemolyt_1_1	R
2588	blaPER-1_1_1	F
2589	blaPER-1_1_1	R
2590	bla_FOX-3_1_1	F
2591	bla_FOX-3_1_1	R
2592	blaA_1_1	F
2593	blaA_1_1	R
2594	psrb_1_1	F
2595	psrb_1_1	R
2596	fmhA_1_1	F
2597	fmhA_1_1	R
2598	mecR1Sepid_1_1	F
2599	mecR1Sepid_1_1	R
2600	blaZ_1_1	F
2601	blaZ_1_1	R
2602	blaOXA-1_1_1	F
2603	blaOXA-1_1_1	R
2604	fox-6_1_1	F
2605	fox-6_1_1	R
2606	blaPrmi_1_1	F
2607	blaPrmi_1_1	R
2608	aacA_aphDStwar_1_1	F
2609	aacA_aphDStwar_1_1	R
2610	aacC1_1_2	F

SEQ ID NO	Probe name	Direction
2611	aacC1_1_2	R
2612	aacC2_1_1	F
2613	aacC2_1_1	R
2614	strB_1_1	F
2615	strB_1_1	R
2616	aadA_1_1	F
2617	aadA_1_1	R
2618	aadB_1_2	F
2619	aadB_1_2	R
2620	aadD_1_1	F
2621	aadD_1_1	R
2622	aacA4_1_2	F
2623	aacA4_1_2	R
2624	strA_1_1	F
2625	strA_1_1	R
2626	aph-A3_1_1	F
2627	aph-A3_1_1	R
2628	aacC1_1_1	F
2629	aacC1_1_1	R
2630	aacA4_1_1	F
2631	aacA4_1_1	R
2632	aacA-aphD_1_1	F
2633	aacA-aphD_1_1	R
2634	I-spc_1_1	F
2635	I-spc_1_1	R
2636	aphA3_1_1	F
2637	aphA3_1_1	R
2638	ermC_1_1	F
2639	ermC_1_1	R
2640	linB_1_1	F
2641	linB_1_1	R
2642	satSA_1_1	F
2643	satSA_1_1	R
2644	mdrSA_1_1	F
2645	mdrSA_1_1	R
2646	I-linA_1_1	F
2647	I-linA_1_1	R
2648	ermB_1_2	F
2649	ermB_1_2	R
2650	ermA_1_1	F
2651	ermA_1_1	R
2652	satA_1_1	F
2653	satA_1_1	R
2654	msrA_1_1	F

SEQ ID NO	Probe name	Direction
2655	msrA_1_1	R
2656	mphBM_1_1	F
2657	mphBM_1_1	R
2658	mefA_1_1	F
2659	mefA_1_1	R
2660	mrx_1_1	F
2661	mrx_1_1	R
2662	dfrStrpneu_1_1	F
2663	dfrStrpneu_1_1	R
2664	dfrA_1_1	F
2665	dfrA_1_1	R
2666	cmlA5_1_1	F
2667	cmlA5_1_1	R
2668	catEfaecium_1_1	F
2669	catEfaecium_1_1	R
2670	cat_1_1	F
2671	cat_1_1	R
2672	tetAJ_1_1	F
2673	tetAJ_1_1	R
2674	tetL_1_1	F
2675	tetL_1_1	R
2676	tetM_1_1	F
2677	tetM_1_1	R
2678	vanH(tn)_1_1	F
2679	vanH(tn)_1_1	R
2680	vanA_1_1	F
2681	vanA_1_1	R
2682	vanHB2_1_1	F
2683	vanHB2_1_1	R
2684	vanR_1_1	F
2685	vanR_1_1	R
2686	vanRB2_1_1	F
2687	vanRB2_1_1	R
2688	vanS(tn)_1_1	F
2689	vanS(tn)_1_1	R
2690	vanSB2_1_1	F
2691	vanSB2_1_1	R
2692	vanWB2_1_1	F
2693	vanWB2_1_1	R
2694	ddl_1_1	F
2695	ddl_1_1	R
2696	ble_1_1	F
2697	ble_1_1	R
2698	vanXB2_1_1	F

SEQ ID NO	Probe name	Direction
2699	vanXB2_1_1	R
2700	vanY(tn)_1_1	F
2701	vanY(tn)_1_1	R
2702	vanYB2_1_1	F
2703	vanYB2_1_1	R
2704	vanB_1_1	F
2705	vanB_1_1	R
2706	vanZ(tn)_1_1	F
2707	vanZ(tn)_1_1	R
2708	vanC-2_1_1	F
2709	vanC-2_1_1	R
2710	vanX(tn)_1_1	F
2711	vanX(tn)_1_1	R
2712	acrB_1_1	F
2713	acrB_1_1	R
2714	mexB_1_2	F
2715	mexB_1_2	R
2716	I-qacA_1_1	F
2717	I-qacA_1_1	R
2718	sulI_1_1	F
2719	sulI_1_1	R
2720	sul_1_1	F
2721	sul_1_1	R
2722	cadBStalugd_1_1	F
2723	cadBStalugd_1_1	R
2724	mexA_1_1	F
2725	mexA_1_1	R
2726	acrR_1_1	F
2727	acrR_1_1	R
2728	emeA_1_1	F
2729	emeA_1_1	R
2730	acrA_1_1	F
2731	acrA_1_1	R
2732	rtn_1_1	F
2733	rtn_1_1	R
2734	abcXStrpmut_1_1	F
2735	abcXStrpmut_1_1	R
2736	qacEdelta1_1_1	F
2737	qacEdelta1_1_1	R
2738	elkT-abcA_1_1	F
2739	elkT-abcA_1_1	R
2740	I-cadA_1_1	F
2741	I-cadA_1_1	R
2742	albA_1_1	F

SEQ ID NO	Probe name	Direction
2743	albA_1_1	R
2744	wzm_1_1	F
2745	wzm_1_1	R
2746	msrCb_1_1	F
2747	msrCb_1_1	R
2748	nov_1_1	F
2749	nov_1_1	R
2750	wzt_1_1	F
2751	wzt_1_1	R
2752	wbbl_1_1	F
2753	wbbl_1_1	R
2754	norA23_1_1	F
2755	norA23_1_1	R
2756	mexR_1_1	F
2757	mexR_1_1	R
2758	arr2_1_1	F
2759	arr2_1_1	R
2760	mreA_1_1	F
2761	mreA_1_1	R
2762	I-cadC_1_1	F
2763	I-cadC_1_1	R
2764	uvrA_1_1	F
2765	uvrA_1_1	R
2766	CRD2_1_1	F
2767	CRD2_1_1	R
2768	CDR1_1_1	F
2769	CDR1_1_1	R
2770	CDR1_2_1	F
2771	CDR1_2_1	R
2772	MET3_1_1	F
2773	MET3_1_1	R
2774	FET3_1_1	F
2775	FET3_1_1	R
2776	FTR2_1_1	F
2777	FTR2_1_1	R
2778	MDR1-7_1_1	F
2779	MDR1-7_1_1	R
2780	ERG11_1_1	F
2781	ERG11_1_1	R
2782	SEC20_1_1	F
2783	SEC20_1_1	R
2784	rbcL_1_1	F
2785	rbcL_1_1	R
2786	LDHA(hu)_1_1	F

SEQ ID NO	Probe name	Direction
2787	LDHA(hu)_1_1	R
2788	GAPD(hu)_1_1	F
2789	GAPD(hu)_1_1	R
2790	b-Act(hu)_1_1	F
2791	b-Act(hu)_1_1	R
2792	ARHGDIA(hu)_1_1	F
2793	ARHGDIA(hu)_1_1	R
2794	PGK1(hu)_1_1	F
2795	PGK1(hu)_1_1	R
2796	rbcL_1_2	F
2797	rbcL_1_2	R
2798	16SPa_1_1	F
2799	16SPa_1_1	R
2800	23SEfaecium_2_1	F
2801	23SEfaecium_2_1	R
2802	16SStrepyog_1_1	F
2803	16SStrepyog_1_1	R
2804	16SStrepneu_1_1	F
2805	16SStrepneu_1_1	R
2806	16SStrepagalactiae_1_1	F
2807	16SStrepagalactiae_1_1	R
2808	16SEfaecium_1_1	F
2809	16SEfaecium_1_1	R
2810	16SEfaecium_2_1	F
2811	16SEfaecium_2_1	R
2812	16SRNAEf_2_1	F
2813	16SRNAEf_2_1	R
2814	16SKpn_1_1	F
2815	16SKpn_1_1	R
2816	16SSa_3_1	F
2817	16SSa_3_1	R
2818	16SRNAEf_1_1	F
2819	16SRNAEf_1_1	R
2820	16SShominis_1_1	F
2821	16SShominis_1_1	R
2822	16SShaemolyt_1_1	F
2823	16SShaemolyt_1_1	R
2824	23SEfaecium_1_1	F
2825	23SEfaecium_1_1	R
2826	16SrRNAPrmi_1_1	F
2827	16SrRNAPrmi_1_1	R
2828	16SrRNAPrvu1_1_1	F
2829	16SrRNAPrvu1_1_1	R
2830	16SSa_1_1	F

SEQ ID NO	Probe name	Direction
2831	16SSa_1_1	R
2832	16SKlox_1_1	F
2833	16SKlox_1_1	R
2834	p53_1_1	F
2835	p53_1_1	R
2836	0135mihck_1_1	F
2837	0135mihck_1_1	R
2838	FAN_1_1	F
2839	FAN_1_1	R
2840	0270cap_1_1	F
2841	0270cap_1_1	R
2909	16SStrepdysgal_1_1	F
2910	16SStrepdysgal_1_1	R
2911	carO_1_1	F
2912	carO_1_1	R
2913	gacS_1_1	F
2914	gacS_1_1	R
2915	dhbA_1_1	F
2916	dhbA_1_1	R
2917	dhbB_1_1	F
2918	dhbB_1_1	R
2919	sid_1_1	F
2920	sid_1_1	R
2921	csuD_1_1	F
2922	csuD_1_1	R
2923	csuC_1_1	F
2924	csuC_1_1	R
2925	tnp-ACIBA_1_1	F
2926	tnp-ACIBA_1_1	R
2927	waaA-ACIBA_1_1	F
2928	waaA-ACIBA_1_1	R
2929	csuB_1_1	F
2930	csuB_1_1	R
2931	csuA_B_1_1	F
2932	csuA_B_1_1	R
2933	csuA_1_1	F
2934	csuA_1_1	R
2935	put1_1_1	F
2936	put1_1_1	R
2937	por_1_1	F
2938	por_1_1	R
2939	abc_1_1	F
2940	abc_1_1	R
2941	furACIBA_1_1	F

SEQ ID NO	Probe name	Direction
2942	furACIBA_1_1	R
2943	dec_1_1	F
2944	dec_1_1	R
2945	cysI_1_1	F
2946	cysI_1_1	R
2947	trpE_1_1	F
2948	trpE_1_1	R
2949	put3_1_1	F
2950	put3_1_1	R
2951	ompA-ACIBA_1_1	F
2952	ompA-ACIBA_1_1	R
2953	aacA4ENCL_1_1	F
2954	aacA4ENCL_1_1	R
2955	AdeR-ACIBA_1_1	F
2956	AdeR-ACIBA_1_1	R
2957	adeA-ACIBA_1_1	F
2958	adeA-ACIBA_1_1	R
2959	aac(6p)-lb7_1_1	F
2960	aac(6p)-lb7_1_1	R
2961	adeB-ACIBA_1_1	F
2962	adeB-ACIBA_1_1	R
2963	adeC-ACIBA_1_1	F
2964	adeC-ACIBA_1_1	R
2965	AdeS-ACIBA_1_1	F
2966	AdeS-ACIBA_1_1	R
2967	blaL2_1_1	F
2968	blaL2_1_1	R
2969	blaMIR-3_1_1	F
2970	blaMIR-3_1_1	R
2971	ampR_1_1	F
2972	ampR_1_1	R
2973	ampC-ENCL_1_1	F
2974	ampC-ENCL_1_1	R
2975	blaL1_1_1	F
2976	blaL1_1_1	R
2977	asr_1_1	F
2978	asr_1_1	R
2979	lacZ_1_1	F
2980	lacZ_1_1	R
2981	ehuS_1_1	F
2982	ehuS_1_1	R
2983	ehuV_1_1	F
2984	ehuV_1_1	R
2985	slyA_1_1	F

SEQ ID NO	Probe name	Direction
2986	slyA_1_1	R
2987	ORF165_1_1	F
2988	ORF165_1_1	R
2989	ehuU_1_1	F
2990	ehuU_1_1	R
2991	ehuT_1_1	F
2992	ehuT_1_1	R
2993	ORF295_1_1	F
2994	ORF295_1_1	R
2995	ehuA_1_1	F
2996	ehuA_1_1	R
2997	ORF400_1_1	F
2998	ORF400_1_1	R
2999	H+ATPase_1_1	F
3000	H+ATPase_1_1	R
3001	sulII_1_1	F
3002	sulII_1_1	R
3003	smeE_1_1	F
3004	smeE_1_1	R
3005	eE_1_1	F
3006	eE_1_1	R
3007	StmPr1_1_1	F
3008	StmPr1_1_1	R
3009	eD_2_1	F
3010	eD_2_1	R
3011	ppi_1_1	F
3012	ppi_1_1	R
3013	pmp-STEMA_1_1	F
3014	pmp-STEMA_1_1	R
3015	pam_1_1	F
3016	pam_1_1	R
3017	ORF4-STEMA_1_1	F
3018	ORF4-STEMA_1_1	R
3019	ORF2-STEMA_1_1	F
3020	ORF2-STEMA_1_1	R
3021	et_1_1	F
3022	et_1_1	R
3023	eF_1_1	F
3024	eF_1_1	R
3025	StmPr2_1_1	F
3026	StmPr2_1_1	R
3027	smeF4494_1_1	F
3028	smeF4494_1_1	R
3029	coa_3_1	F

SEQ ID NO	Probe name	Direction
3030	coa_3_1	R
3031	coa_2_2	F
3032	coa_2_2	R
3033	fasCAXStrdysg_1_1	F
3034	fasCAXStrdysg_1_1	R
3035	sloStrep_1_1	F
3036	sloStrep_1_1	R
3037	ydhK_1_1	F
3038	ydhK_1_1	R
3039	tetA-ACIBA_1_1	F
3040	tetA-ACIBA_1_1	R
3041	tetR-ACIBA_1_1	F
3042	tetR-ACIBA_1_1	R

Claims

1. An analytical device for direct identification and characterisation of microorganisms in a sample or clinical specimen, wherein the analytical device comprises species specific gene probes which are (i) selected from DNA sequences or partial DNA sequences of the microorganisms to be identified or DNA sequences complementary or homologous thereto, and (ii) have a length of at least 100 nucleotides (nt).
2. The analytical device of claim 1, which is a DNA coated bead, a set of DNA coated beads, or a DNA microarray, preferably a DNA microarray.
3. The analytical device of claim 1 or 2 which is suitable for species specific identification of one microbial strain or a plurality of microbial strains in clinical specimens comprising microbial strains, especially bacteria and/or fungi, and which furthermore allows differentiation of the target species from each other and from non-target-species contained in one sample comprising a plurality of microbial strains.
4. The analytical device of claim 3 which is suitable for species specific identification of microorganisms causing bacteremia, fungemia or sepsis in a clinical sample.
5. The analytical device of any one of claims 1 to 4, wherein the device is suitable for species specific identification of microorganisms selected from the group consisting of Staphylococci, *E. coli* and *Candida* sp., preferably for species specific identification of Staphylococci.
6. The analytical device of any one of claims 1 to 5, which is suitable for species specific identification of microorganisms selected from the group consisting of *Staphylococcus aureus*, *Escherichia coli*, CoNS (including *Staphylococcus epidermidis*, *Staphylococcus haemolyticus*, *Staphylococcus lugdunensis*, *Staphylococcus warneri*, *Staphylococcus saprophyticus*), *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Pseudomonas aeruginosa*, *Streptococcus agalactiae*, *Streptococcus mutans*, *Enterococcus faecalis*, *Enterococcus faecium*, *Proteus mirabilis*, *Proteus vulgaris*, *Candida albicans*, *Acinetobacter baumannii*.
7. The analytical device of claim 6, wherein the device is suitable for species specific identification of at least *S. aureus* and preferably comprises gene probes

selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58, 59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902 and 2903, more preferably from SEQ ID NO:4, 68, 69 and 71, even more preferably comprises at least SEQ ID NO:71.

8. The analytical device of claim 6 or 7, wherein the device is suitable for species specific identification of at least *S. aureus*, *E. coli*, CoNS, *Enterococcus* sp., and/or *Candida* sp., and preferably comprises gene probes selected from

a) SEQ ID NO:4, 68, 69 and 71, preferably SEQ ID NO: 71 for identification of *S. aureus*;

b) SEQ ID NO: 145, 160, 161 and 170, preferably SEQ ID NO:145 for identification of *E. coli*;

c) SEQ ID NO:177, 178 and 190, preferably SEQ ID NO:178 for identification of *S. epidermidis*;

d) SEQ ID NO:60, 61, 70, 72, 78 and 125, preferably SEQ ID NO:78 for identification of the genus *Staphylococci* including *S. aureus*;

e) SEQ ID NO:210, 224 and 2906, preferably 2906 for identification of CoNS;

f) SEQ ID NO:308, 310 and 314, preferably SEQ ID NO:310 for identification of *Enterococcus faecalis*;

g) SEQ ID NO:380 and 385, preferably SEQ ID NO:380 for identification of *Enterococcus faecium*;

h) SEQ ID NO:232 and 249, preferably SEQ ID NO:249 for identification of *Candida albicans*;

respectively.

9. The analytical device of claim 8, which is suitable for species specific detection or differentiation of

(i) *S. aureus* and comprises SEQ ID NO:71;

(ii) CoNS and comprises SEQ ID NO:2906;

(iii) *E. coli* and comprises SEQ ID NO:145; and/or

(iv) *Candida albicans* and comprises SEQ ID NO:249.

10. The analytical device of any one of claims 7 to 9, which is suitable for additional species specific identification or differentiation of one or more of *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Streptococcus pneumoniae*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa*, *Proteus mirabilis* and *Proteus vulgaris*.

5 11. The analytical device of any one of claims 1 to 10, which additionally comprises virulence and/or resistance gene probes.

12. The analytical device of any one of claims 1 to 11, wherein

(i) the length of the gene probes is from 100 to 1000 nt, preferably from 200 to 800 nt; and/or

10 (ii) specific gene probes are present for each specific microbial species or group of microorganisms to be identified or differentiated, which gene probes preferably are DNA sequences selected from the groups consisting of (a) species specific gene probes, (b) virulence gene probes and (c) resistance gene probes; and/or

15 (iii) the sample is selected from whole blood, serum, urine, saliva, liquor, sputum, punktate, stool, pus, wound fluid, swabs, positive blood cultures, preferably is positive blood cultures; and/or

(iv) the device further comprises DNA sequences selected from the group (d) consisting of control gene probes coding for negative controls and positive controls.

13. The analytical device of claim 3, which is suitable for diagnosis of

20 (i) bacteremia, fungemia or sepsis, wherein the device preferably comprises probes for species specific identification of at least *S. aureus*, *E. coli*, CoNS, Enterococcus sp., and Candida sp.;

(ii) respiratory tract infections, wherein the device preferably comprises probes for species specific identification of at least Candida sp., *S. aureus* and *P. aeruginosa*;
25 and/or

(iii) urinary tract infenctions, wherein the device preferably comprises probes for species specific identification of at least *E. coli*, Enterococci sp., Candida sp. and Proteus sp..

30 14. The analytical device of any one of claims 1 to 13, wherein the set of gene probes preferably comprises gene probes selected from

(a) species specific gene probes for

- (i) *Staphylococcus aureus* including gene probes derived from *clfA*, *clfB*, *coa*, *lytM*, *NAG*, *sodA*, *sodB*, *epiP-bsaP*, *geh*, *hemC*, *hemD*, *hsdS*, *lip*, *menC*, *nuc*, *SAV0431*, *SAV0440*, *SAV0441*, *spa*, *ebpS*, *fbpA*, *fib*, *fnbB*, *srtA*, *fnbA*, *femA*, *fmhB*,
5 *fmhA*;
- (ii) *Escherichia coli* including gene probes derived *b1169*, *fliCb*, *nfrB*, *yachH*, *ycdS*, *yciQ*, *shuA*;
- (iii) *Staphylococcus epidermidis* including gene probes derived from *ardeSE0106*, *ardeSE0107*, *atlE*, *agrB*, *alphSE1368*, *gad*, *glucSE1191*, *icaB*, *mvaSSepid*,
10 *nitreSE1972*, *nitreSE1974*, *nitreSE1975*, *oiamtSE1209*, *ORF1Sepid*, *ORF3bSepid*, *qacR*, *ureSE1865*, *ureSE1867*;
- (iv) *Staphylococcus haemolyticus* including gene probes derived from *femBShaemolyt*, *mvaDShaemolyt*, *mvaSShaemolyticus*, *RNApolsigm*;
- (v) *Staphylococcus lugdunensis* including gene probes derived from *agrB2Stalugd*,
15 *agrC2Stalugd*, *slamStalugd*;
- (vi) *Staphylococcus warneri* including gene probes derived from *msrw1Stwar*, *nukMStwar*, *proDStwar*, *proMStwar*, *sigrpoStwar*, *tnpStwar*;
- (vii) *Staphylococcus saprophyticus* including gene probes derived from *RNApolsigmSsapro*;
- 20 (viii) *Staphylococcus hominis* including gene probes derived from *ydhK*;
- (ix) *Candida albicans* including gene probes derived from *ARG56*, *ASL43f*, *BGL2*, *CCT8*, *CDC37*, *CEF3*, *CHS1*, *CHS2*, *CHS4*, *CHS5*, *CHT1*, *CHT2*, *CHT4*, *CSA1*, *5triphosphatase*, *AAF1*, *ADH1*, *ALS1*, *ALS7*, *EDT1*, *ELF*, *ESS1*, *FAL1*, *GAP1*, *GNA1*, *GSC1*, *GSL1*, *HIS1*, *HTS1*, *HWP1*, *HYR1*, *INT1a*, *KRE15f*, *KRE6*, *KRE9*, *MIG1*, *MLS1*,
25 *MP65*, *NDE1*, *PFK2*, *PHR1*, *PHR2*, *PHR3*, *PRA1*, *PRS1*, *RBT1*, *RBT4*, *RHO1*, *RNR1*, *RPB7*, *RPL13*, *RVS167*, *SHA3*, *SKN1*, *SRB1*, *TCA1*, *TRP1*, *YAE1*, *YRB1*, *YST1exon2*;
- (x) *Enterococcus faecalis* including gene probes derived from *arcA*, *arcC*, *bkdA*, *camE1*, *csrA*, *dacA*, *dfr*, *dhoD1a*, *ABC-eltA*, *agrBfs*, *agrCfs*, *dnaE*, *ebaA*, *ebaB*, *eep*, *efaR*, *gls24_glsB*, *gph*, *gyrAEf*, *metEf*, *mntHCb2*, *mob2*, *mvaD*, *mvaE*, *parC*, *pcfG*,
30 *phoZ*, *polC*, *ptb*, *recS1*, *rpoN*, *tms*, *tyrDC*, *tyrS*;

(xi) *Enterococcus faecium* including gene probes derived from *bglB*, *bglR*, *bglS*, *efmA*, *efmB*, *efmC*, *mreC*, *mreD*, *mvaDEfaecium*, *mvaEEfaecium*, *mvaK1Efaecium*, *mvaK2Efaecium*, *mvaSEfaecium*, *orf3_4Efaeciumb*, *orf6_7Efaecium*, *orf7_8Efaecium*, *orf9_10Efaecium*;

5 (xii) *Klebsiella pneumonia* including gene probes derived from *atsA*, *budC*, *citA*, *citW*, *citX*, *dalk*, *acoA*, *acoB*, *acoC*, *ahlK*, *fimK*, *glfKPN2*, *ltrA*, *mdcC*, *mdcH*, *nifF*, *nifK*, *nifN*, *tyrP*, *wbbO*, *wzb*, *wzmKPN2*, *wztKPN2*, *yojH*, *liac*;

(xiii) *Klebsiella oxytoca* including gene probes derived from *gatY*, *pelX*, *tagH*, *tagK*, *tagT*;

10 (xvi) *Pseudomonas aeruginosa* including gene probes derived from *glpR*, *lasRb*, *OrfX*, *pa0260*, *pa0572*, *pa0625*, *pa0636*, *pa1046*, *pa1069*, *pa1846*, *pa3866*, *pa4082*, *pilAp*, *PilAp2*, *pilC*, *PstP*, *uvrDII*, *vsmI*, *vsmR*, *xcpX*;

(xv) *Streptococcus pneumoniae* including gene probes derived from *cap1EStrpneu*, *cap1FStrpneu*, *cap1GStrpneu*, *cap3AStrpneu*, *cap3BStrpneu*, *celAStrpneu*,
 15 *celBStrpneu*, *cglAStrpneu*, *cglBStrpneu*, *cglCStrpneu*, *cglDStrpneu*, *cinA*, *cps14EStrpneu*, *cps14FStrpneu*, *cps14GStrpneu*, *cps14HStrpneu*, *cps19aHStrpneu*, *cps19aIStrpneu*, *cps19aKStrpneu*, *cps19fGStrpneu*, *cps23fGStrpneu*, *dexB*, *dinF*, *1760Strpneu*, *acyPStrpneu*, *endAStrpneu*, *exoAStrpneu*, *exp72*, *fnlAStrpneu*, *fnlBStrpneu*, *fnlCStrpneu*, *gct18Strpneu*,
 20 *hexB1*, *hftsHStrpneu*, *immunofrag1Strpneu*, *immunofrag2Strpneu*, *immunofrag3Strpneu*, *kdtBStrpneu*, *lysAStrpneu*, *pcpBStrpneu*, *pflCStrpneu*, *plpA*, *prtA1Strpneu*, *pspC1Strpneu*, *pspC2*, *purRStrpneu*, *pyrDAStrpneu*, *SP0828Strpneu*, *SP0830Strpneu*, *SP0833Strpneu*, *SP0837_38Strpneu*, *SP0839Strpneu*, *ugdStrpneu*, *uncC*, *vicXStrpneu*, *wchA6bStrpneu*,
 25 *wci4Strpneu*, *wciK4Strpneu*, *wciL4Strpneu*, *wciN6bStrpneu*, *wciO6bStrpneu*, *wciP6bStrpneu*, *wciY18Strpneu*, *wzdbStrpneu*, *wze6bStrpneu*, *wzy18Strpneu*, *wzy4Strpneu*, *wzy6bStrpneu*, *xpt*;

(xvi) *Streptococcus agalactiae* including gene probes derived from *cpsA1Strgal*, *cpsB1Strgal*, *cpsC1Strgal*, *cpsD1Strgal*, *cpsE1Strgal*, *cpsG1Strgal*, *cpsIStrgal*,
 30 *cpsJStrgal*, *cpsKStrgal*, *cpsMStrgal*, *cpsYStrgal*, *cylBStraga*, *cylEStraga*, *cylFStraga*, *cylHStraga*, *cylIStraga*, *cylJStraga*, *cylKStraga*, *0487Straga*, *0488Straga*, *0493Straga*, *0495Straga*, *0498Straga*, *0500Straga*, *0502Straga*,

0504Straga, folDStraga, neuA1Strgal, neuB1Strgal, neuC1Strgal, neuD1Strgal, recNStraga, ileSStraga;

(xvii) *Streptococcus pyogenes* including gene probes derived from *cyclStrpyog, fah_rph_hlo_Strpyog, int, int315.5, oppD, , SpyM3_1351, vicXStrpyog;*

5 (xviii) *Streptococcus mutans* including gene probes derived from *573Stprmut, 580SStprmut, 581_582SStprmut, 584SStprmut, dltAStrmut, dltBStrmut, dltCpx1Strmut, dltDStrmut, lichStrbov, lytRStprmut, lytSStprmut, pepQStrmut, pflCStrmut, recNStprmut, ytgBStrmut;*

10 (xix) *Proteus mirabilis* including gene probes derived from *atfA, atfB, atfC, ccmPrmi1, cyaPrmi, flfB, flfD, flfN, flhD, floA, ftsK, gstB, hemCPrmi, hemDPrmi, hev, katA, lpp1, menE, mfd, nrpA, nrpB, nrpG, nrpS, nrpT, nrpU, pat, pmfA, pmfC, pmfE, ppaA, rsbA, rsbC, speB, stmA, stmB, terA, umoA, umoB, umoC, ureR, xerC, ygbA;*

15 (xx) *Proteus vulgaris* including gene probes derived from *envZPrvu, frdC, frdD, lad, tna2;*

(xxi) *Acinetobacter baumannii* including gene probes derived from *carO, gacS, dhbA, dhbB, sid, csuD, csuC, tnp-ACIBA, waaA-ACIBA, csuB, csuA_B, csuA, put1, por, abc, furACIBA, dec, cysI, trpE, put3, ompA-ACIBA; and/or*

(b) virulence gene probes for

20 (i) *Staphylococcus aureus* including gene probes derived from *bsaE, bsaG, cap5h, cap5i, cap5j, cap5k, cap8H, cap8I, cap8J, cap8K, I-hld, I-hysA, I-IgGbg, EDIN, eta, etb, hglA, hglB, hglC, hla, hlb, lukF, lukS, NAG, sak, sea, seb, sec1, seg, seh, sel, set15, set6, set7, set8, sprV8, tst, I-sdrC, I-sdrD, I-sdrE;*

25 (ii) *Escherichia coli* including gene probes derived from *b1202, eae, eltB, escR, escT, escU, espB, fes, fteA, hlyA, hlyB, iucA, iucB, iucC, papG, rfbE, shuA, SLTII, toxA-LTPA, VT2vaB;*

(iii) *Staphylococcus epidermidis* including gene probes derived from *gcaD, hld_orf5, icaC, icaD, icaR, psm_beta1and2, purR, spoVG, yabJ;*

(iv) *Staphylococcus haemolyticus* including gene probes derived from *lipShaemolyt;*

30 (v) *Staphylococcus lugdunensis* including gene probes derived from *fbIStalugd, slushABCStalugd;*

- (vi) *Staphylococcus warneri* including gene probes derived from *gehAStwar*;
- (vii) *Candida albicans* including gene probes derived from *CCN1, CDC28, CLN2, CPH1, CYB1, EFG1, MNT1, RBF1, RBF1, RIM101, RIM8, SEC14, SEC4, TUP1, YPT1, ZNF1CZF1*;
- 5 (viii) *Enterococcus faecalis* including gene probes derived from *asa1, asp1, cgh, cyla, cylB, cylI, cylL_cylS, cylM, ace, ef00108, ef00109, ef0011, ef00113, ef0012, ef0022, ef0031, ef0032, ef0040, ef0058, enlA, esa, esp, gelE, groEL, groES, rt1, sala, salb, sea1, sep1, vicK, yych, yycI, yycJ*;
- (ix) *Enterococcus faecium* including gene probes derived from *entA_entI, entD,*
 10 *entR, oep, sagA*;
- (x) *Klebsiella pneumoniae* including gene probes derived from *cim, aldA, hemly, pSL017, pSL020, rcsA, rmlC, rmlD, waaG, wbbD, wbbM, wbbN, wbdA, wbdC, wztKpn, yibD*;
- (xi) *P. aeruginosa* including gene probes derived from *aprA, aprE, ctx, algB, algN,*
 15 *algR, ExoS, fpvA, lasRa, lipA, lipH, Orf159, Orf252, pchG, PhzA, PhzB, PLC, plcN, plcR, pvdD, pvdF, pyocinS1, pyocinS1im, pyocinS2, pys2, rbf303, rhlA, rhlB, rhlR, TnAP41, toxA*;
- (xii) *Streptococcus pneumoniae* including gene probes derived from *igaStrpneu, lytA, nanA, nanBStrpneu, pcpCStrpneu, ply, prtAStrpneu, pspA, SP0834Strpneu,*
 20 *sphtraStrpneu, wciJStrpneu, wziyStrpneu, wzxStrpneu*;
- (xiii) *Streptococcus agalactiae* including gene probes derived from *CAMPfactor, 0499Straga, hylStragal, lipStragal*;
- (xiv) *Streptococcus pyogenes* including gene probes derived from *DNaseIStrpyog, fba2Strpyog, fhuAStrpyog, fhuB1Strpyog, fhuDStrpyog, fhuGStrpyog, hylA, hylP,*
 25 *hyLP2, oppB, ropB, scpAStrpyog, sloStrpyog, smeZ- Strpyog, sof, speA, speB2Strpyog, speCStrpyog, speJStrpyog, srtBStrpyog, srtCStrpyog, srtEStrpyog, srtFStrpyog, srtGStrpyog, srtIStrpyog, srtKStrpyog, srtRStrpyog, srtTStrpyog, vicKStrpyog*;
- (xvi) *Streptococcus mutans* including gene probes derived from *hlyXStrmut,*
 30 *perMStrmut*;

(xvii) *Proteus mirabilis* including gene probes derived from *flaA*, *laD*, *fliA*, *hpmA*, *hpmB*, *lpsPrmi*, *mrpA*, *mrpB*, *mrpC*, *mrpD*, *mrpE*, *mrpF*, *mrpG*, *mrpH*, *mrpI*, *mrpJ*, *patA*, *putA*, *uca*, *ureDPrmi*, *ureEPrmi*, *ureFPrmi*, *zapA*, *zapB*, *zapD*, *zapE*; and/or

(c) resistance gene probes derived from genes coding for

- 5 (i) beta-lactams resistance including gene probes derived from *blaIMP-7*, *mecISepid*, *blaOXA-10*, *blaB*, *ampC*, *blaR*, *blaOXA-32*, *bla-CTX-M-22*, *pbp2aStrpneu*, *blaSHV-1*, *blaOXA-2*, *blaRShaemolyt*, *blaIMP-7*, *mecR*, *blaOXY*, *dacCStrpyog*, *femA*, *mecA*, *blaIShaemolyt*, *blavim*, *pbp2b*, *pbp2primeSepid*, *pbp2x*, *pbp3Saureuc*, *pbp4*, *pbp5Efaecium*, *pbpC*, *mecI*, *pbp1a*, *blaI*, *blaTEM-106*, *blaOXY-*
10 *KLOX*, *ftsWEF*, *fmhB*, *cumA*, *blaPER-1*, *bla_FOX-3*, *blaA*, *psrb*, *fmhA*, *mecR1Sepid*, *blaZ*, *blaOXA-1*, *fox-6*, *blaPrmi*;
- (ii) aminoglycosides resistance including gene probes derived from *aacA_aphDStwar*, *aacC1*, *aacC2*, *strB*, *aadA*, *aadB*, *aadD*, *aacA4*, *strA*, *aph-A3*, *aacC1*, *aacA4*, *aacA-aphD*, *I-spc*, *aphA3*, ; *aacA4ENCL*, *aac(6p)-lb7*;
- 15 (iii) macrolides-lincosamines-streptogramins resistance including gene probes derived from *ermC*, *linB*, *satSA*, *mdrSA*, *I-linA*, *ermB*, *ermA*, *satA*, *msrA*, *mphBM*, *mefA*, *mrx*;
- (iv) trimethoprim resistance including gene probes derived from *dfrA*, *dfrStrpneu*;
- (v) chloramphenicol resistance including gene probes derived from *cat*,
20 *catEfaecium*, *cmlA5*;
- (vi) tetracyclines resistance including gene probes derived from *tetA*, *tetL*, *tetM*;
- (vii) glycopeptides resistance including gene probes derived from *vanH(tn)*, *vanA*, *vanHB2*, *vanR*, *vanRB2*, *vanS(tn)*, *vanSB2*, *vanWB2*, *ddl*, *ble*, *vanXB2*, *vanY(tn)*, *vanYB2*, *vanB*, *vanZ(tn)*, *vanC-2*, *vanX(tn)*;
- 25 (viii) multiple target resistance including gene probes derived from *acrB*, *mexB*, *I-qacA*, *sulI*, *sul*, *cadBStalugd*, *mexA*, *acrR*, *emeA*, *acrA*, *rtn*, *abcXStrpmut*, *qacEdelta1*, *elkT-abcA*, *I-cadA*, *alba*, *wzm*, *msrCb*, *nov*, *wzt*, *wbbl*, *norA23*, *mexR*, *arr2*, *mreA*, *I-cadC*, *uvrA*, , *AdeR-ACIBA*, *adeA-ACIBA*, *adeB-ACIBA*, *adeC-ACIBA*, *AdeS-ACIBA*;
- 30 (ix) fungicide resistance, especially *C. albicans* fungicide resistance, including gene probes derived from *CRD2*, *CDR1*, *MET3*, *FET3*, *FTR2*, *MDR1-7*, *ERG11*, *SEC20*.

15. The analytical device of any one of claims 1 to 14, wherein

(i) the device comprises the minimal number of species specific gene probes of group (a) as defined in claim 12 or 14 which is sufficient for species identification, preferably the device comprises at least 2 different gene probes per target species of group (a); and/or

(ii) the device comprises the minimal number of virulence gene probes of group (b) as defined in claim 12 or 14 which is sufficient for virulence determination, preferably at least 1 gene probe, more preferably at least 5 different gene probes per target species of group (b); and/or

(iii) the device comprises the minimal number of resistance gene probes of group (c) as defined in claim 12 or 14 which is sufficient for determination of resistance, preferably at least 1 gene probe, more preferably at least 5 different gene probes of group (c); and/or

(iv) the DNA sequences are selected from the group consisting of SEQ ID NOs 1-918 and 2842-2908, complementary sequences thereto, addition mutants, deletion mutants, substitution mutants and homologues thereof.

16. The analytical device of claim 15, wherein

(i) the gene probes of group (a) are selected from SEQ ID NO:SEQ ID NO:1-99, 142-152, 174-199, 209-214, 216-219, 222-229, 231-291, 308-342, 377-393, 399-431, 449-490, 523-591, 606-639, 645-656, 687-701, 706-749, 776-781, 2843-2863, 2902 and 2903;

(ii) the gene probes of group (b) are selected from SEQ ID NO:100-141, 153-173, 200-208, 215, 220-221, 230, 292-307, 343-376, 394-398, 432-448, 491-522, 592-605, 640-644, 657-686, 702-705, 750-775 and 782-784; and/or

(iii) the gene probes of group (c) are selected from SEQ ID NO:785-918, 2864-2875, 2888 and 2907-2908, preferably from SEQ ID NO:785-909, 2864-2875, 2888 and 2907-2908.

17. The analytical device of claim 15 or 16, which

(I) is suitable for identification of *Staphylococcus aureus* and comprises one or more or all of the gene probes selected from SEQ ID NO:3-6, 31, 40, 50, 51, 58,

59, 63, 64, 66-69, 71, 74, 76, 77, 79, 2902, 2903, preferably comprises at least one of the gene probes represented by SEQ ID NO:71, 68, 4 and 69; and/or

(II) is suitable for identification of *Escherichia coli* and comprises one or more or all of the gene probes selected from SEQ ID NO:142, 144, 145, 148, 150-152, 160, 161 and 170, preferably at least one of the gene probe represented by SEQ ID NO:145, 160, 161 and 170; and/or

(III) is suitable for identification of *Staphylococcus epidermidis* and comprises gene probes selected from SEQ ID NO:174, 175, 177, 178, 180-182, 185-193, 198 and 199, preferably at least one of the gene probes represented by SEQ ID NO:177, 178 and 190; and/or

(IV) is suitable for identification of *Staphylococcus haemolyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:211, 213 and 214, preferably at least one of the gene probes represented by SEQ ID NO:211 and 214; and/or

(V) is suitable for identification of *Staphylococcus lugdunensis* and comprises one or more or all of the gene probes selected from SEQ ID NO:216, 217 and 219-221, preferably at least one of the gene probes represented by SEQ ID NO:216, 219, 220 and 221; and/or

(VI) is suitable for identification of *Staphylococcus warneri* and comprises one or more or all of the gene probes selected from SEQ ID NO:224-228 and 230, preferably at least one of the gene probes represented by SEQ ID NO:224, 226, and 230; and/or

(VII) is suitable for identification of *Staphylococcus saprophyticus* and comprises one or more or all of the gene probes selected from SEQ ID NO:222 and 223; and/or

(VIII) is suitable for identification of *Staphylococcus hominis* and comprises one or more or all of the gene probes selected from SEQ ID NO:2096, 194, 229, 211 and 214; and/or

(IX) is suitable for identification of *Candida albicans* and comprises one or more or all of the gene probes selected from SEQ ID NO:231-291, preferably at least one of the gene probes represented by SEQ ID NO:232 and 249; and/or

(X) is suitable for identification of *Enterococcus faecalis* and comprises one or more or all of the gene probes selected from SEQ ID NO:308-310 and 312-342, preferably at least one of the gene probes represented by SEQ ID NO:308, 310 and 314; and/or

- 5 (XI) is suitable for identification of *Enterococcus faecium* and comprises one or more or all of the gene probes selected from SEQ ID NO:377-393, preferably at least one of the gene probes represented by SEQ ID NO:380 and 385; and/or

(XII) is suitable for identification of *Klebsiella pneumoniae* and comprises one or more or all of the gene probes selected from SEQ ID NO:399, 401-404, 408-415,
10 417, 420-423, 425 and 427-431, preferably at least one of the gene probes represented by SEQ ID NO:401, 410 and 430; and/or

(XIII) is suitable for identification of *Klebsiella oxytoca* and comprises one or more or all of the gene probes selected from SEQ ID NO:459 and 466-469, preferably at least one of the gene probes represented by SEQ ID NO:459, 468 and 469; and/or

- 15 (XIV) is suitable for identification of *Pseudomonas aeruginosa* and comprises one or more or all of the gene probes selected from SEQ ID NO:470-485, 487-493 and 505, preferably at least one of the gene probes represented by SEQ ID NO:471, 474, 488 and 505; and/or

(XV) is suitable for identification of *Streptococcus pneumoniae* and comprises one
20 or more or all of the gene probes selected from SEQ ID NO:523-591, preferably at least one of the gene probes represented by SEQ ID NO:558 and 562; and/or

(XVI) is suitable for identification of *Streptococcus agalactiae* and comprises one or more or all of the gene probes selected from SEQ ID NO:606-639, preferably at least one of the gene probes represented by SEQ ID NO:606 and 619; and/or

- 25 (XVII) is suitable for identification of *Streptococcus pyogenes* and comprises one or more or all of the gene probes selected from SEQ ID NO:645-648, 652, 655-656, 658 and 660, preferably at least one of the gene probes represented by SEQ ID NO:645, 658 and 660; and/or

(XVIII) is suitable for identification of *Streptococcus mutans* and comprises one or
30 more or all of the gene probes selected from SEQ ID NO:687-701, preferably at least one of the gene probes represented by SEQ ID NO:687, 691 and 692; and/or

(XIX) is suitable for identification of *Proteus mirabilis* and comprises one or more or all of the gene probes selected from SEQ ID NO:706-710, 712-742 and 744-749, preferably at least one of the gene probes represented by SEQ ID NO:721, 725 and 735; and/or

- 5 (XX) is suitable for identification of *Proteus vulgaris* and comprises one or more or all of the gene probes selected from SEQ ID NO:776-778 and 780-781, preferably at least one of the gene probes represented by SEQ ID NO:776, 777 and 781; and/or

- 10 (XXI) is suitable for identification of *Acinetobacter baumannii* and comprises one or more or all of the gene probes selected from SEQ ID NO:2843-2863, preferably at least one of the gene probes represented by SEQ ID NO:2858 and 2863.

18. The analytical device of claim 17, which further comprises

- (I) for the characterisation of *Staphylococcus aureus*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:100-141, and/or
15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

- (II) for the characterisation of *Escherichia coli*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:153-173, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
20 2888, 2907-2908; and/or

- (III) for the characterisation of *Staphylococcus epidermidis*: one or more or all of the gene probes of group (b) selected from SEQ ID NO:200-208, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875,
2888, 2907-2908; and/or

- 25 (IV) for the characterisation of *Staphylococcus haemolyticus*: one or more or all of the gene probe of group (b) represented by SEQ ID NO:215, and/or
of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(V) for the characterisation of *Staphylococcus lugdunensis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:220-221, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VI) for the characterisation of *Staphylococcus warneri*: one or more or all

5 of the gene probe of group (b) represented by SEQ ID NO:230, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VII) for the characterisation of *Staphylococcus saprophyticus*: one or more or all

10 of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(VIII) for the characterisation of *Staphylococcus hominis*: one or more or all

of the gene probe of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(IX) for the characterisation of *Candida albicans*: one or more or all

15 of the gene probes of group (b) selected from SEQ ID NO:292-307, and/or

of the gene probes of group (c) selected from SEQ ID NO:910-918; and/or

(X) for the characterisation of *Enterococcus faecalis*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:343-376, and/or

20 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XI) for the characterisation of *Enterococcus faecium*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:394-398, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

25 (XII) for the characterisation of *Klebsiella pneumonia*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:432-448, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIII) for the characterisation of *Klebsiella oxytoca*: one or more or all of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIV) for the characterisation of *Pseudomonas aeruginosa*: one or more or all

5 of the gene probes of group (b) selected from SEQ ID NO:491-522, and/or of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XV) for the characterisation of *Streptococcus pneumoniae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:592-605, and/or

10 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVI) for the characterisation of *Streptococcus agalactiae*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:640-644, and/or

15 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XVII) for the characterisation of *Streptococcus pyogenes*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:657-686, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

20 (XVIII) for the characterisation of *Streptococcus viridans*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:702-705, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XIX) for the characterisation of *Proteus mirabilis*: one or more or all

25 of the gene probes of group (b) selected from SEQ ID NO:750-775, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908; and/or

(XX) for the characterisation of *Proteus vulgaris*: one or more or all

of the gene probes of group (b) selected from SEQ ID NO:782-784, and/or

of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

(XXI) for the characterisation of *Acinetobacter baumannii*: one or more or all

5 of the gene probes of group (c) selected from SEQ ID NO:785-909, 2864-2875, 2888, 2907-2908.

19. Use of the analytical device of any one of claims 1-18 for *in vitro* identification and characterisation of microorganisms in a sample or in a clinical specimen, preferably for the diagnosis of a clinical condition, more preferably for the diagnosis
10 of bacteremia, fungemia or sepsis.

20. Use of the analytical device of any one of claims 1-18 for *in vitro* differentiation of a plurality of different microbial strains contained in one sample and/or for species-specific identification of one or more microbial strain contained in a mixture of a plurality of microorganisms.

15 21. An *in vitro* method for identification and characterisation of microorganisms in a sample or in a clinical specimen comprising

(a) isolating the total DNA from the sample or clinical specimen and labelling the DNA with a reporter molecule;

20 (b) applying the DNA thus obtained to the analytical device of anyone of claims 1-18 and hybridising the DNA with the gene probes of the analytical device; and

(c) detecting DNA bound to the analytical device by determination of the amount of the reporter molecules bound to the device.

22. The method of claim 21,

(i) which is a method for diagnosis of bacteremia, fungemia or sepsis; and/or

25 (ii) wherein the clinical specimen is a positive blood culture; and/or

(iii) wherein the ratio of microbial DNA to total DNA isolated from said sample or clinical specimen is less than 100 %, preferably from 1% to 99%; and/or

(iv) wherein the reporter molecule is a fluorochrome; and/or

30 (v) wherein the determination of the amount of reporter molecules bound to the device is achieved by visualization of the reporter molecule; and/or

(vi) wherein the DNA isolated in step (a) is labelled and applied to the analytical device without prior amplification, preferably is labelled by random priming; and/or

(vii) wherein the DNA isolated in step (a) is fragmented before the labelling reaction.

5 23. The method of claim 21 or 22, wherein the analytical device is a DNA microarray and the detection is preferably performed using a DNA microarray reader.

10 24. The method of claim 21 or 22, wherein the analytical device is a DNA coated bead or a set of DNA coated beads, and the application and/or detection step is preferably performed in a microfluidic device.

25. A kit for detection of microorganisms in a sample or clinical specimen comprising the analytical device of any one of claims 1 to 18.

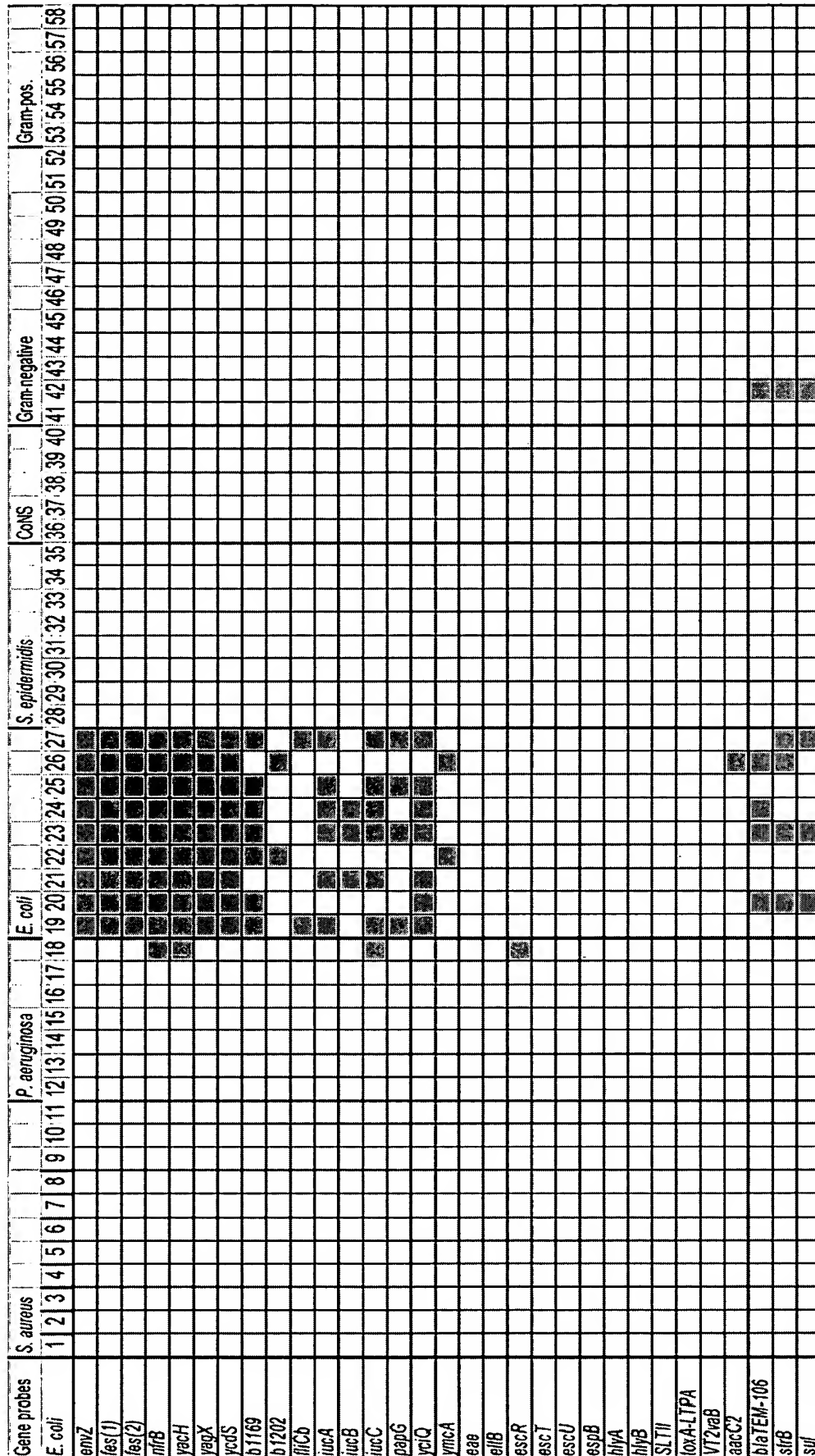
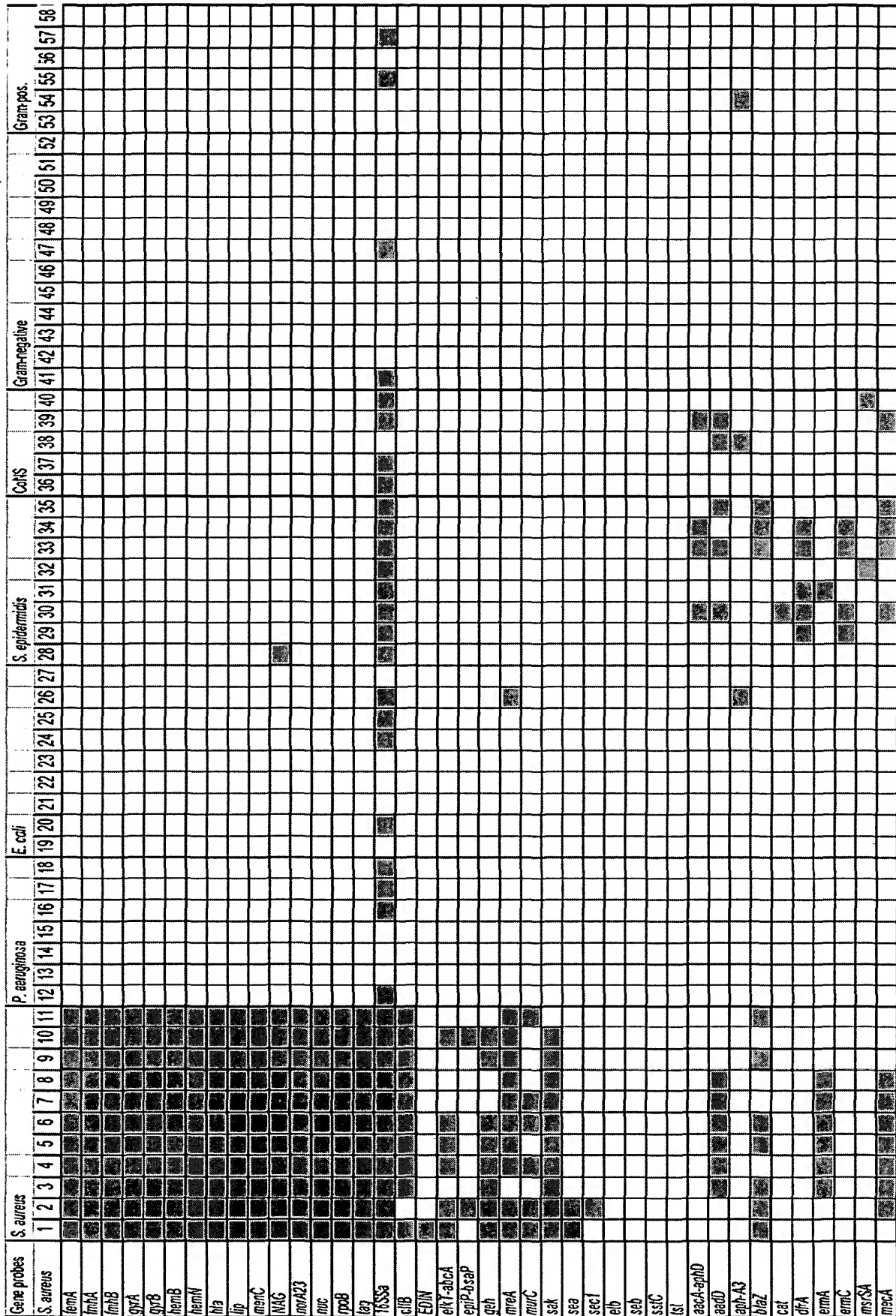
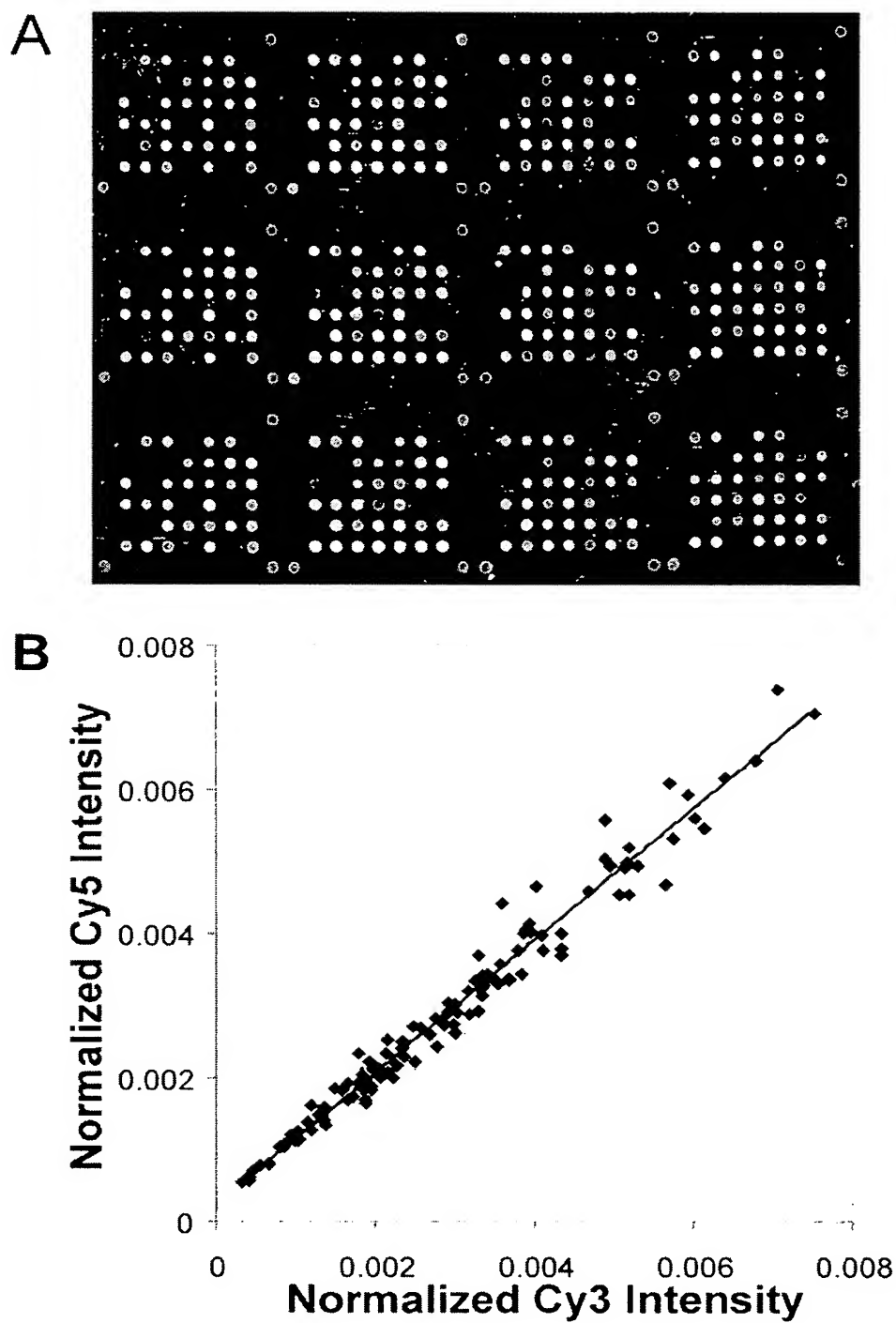


Fig.1A



**Fig.2**

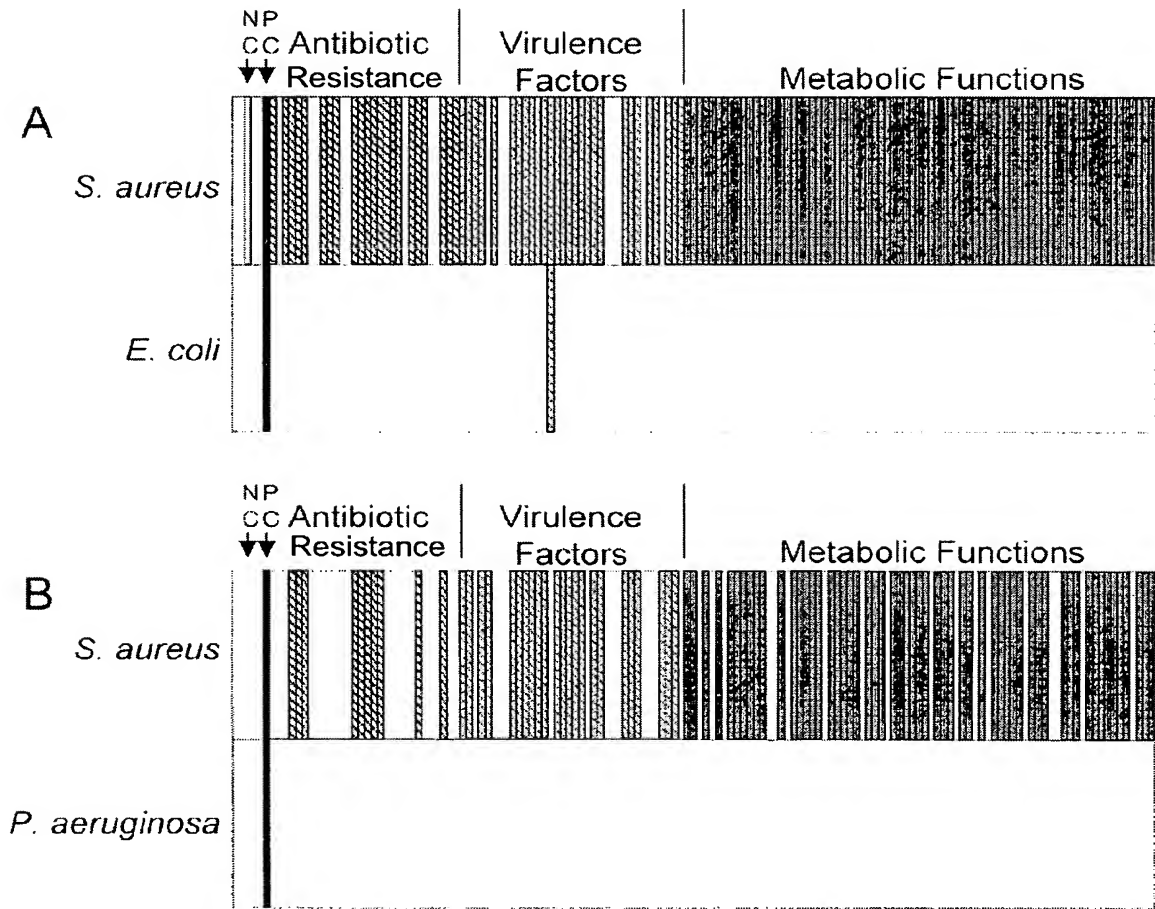


Fig.3

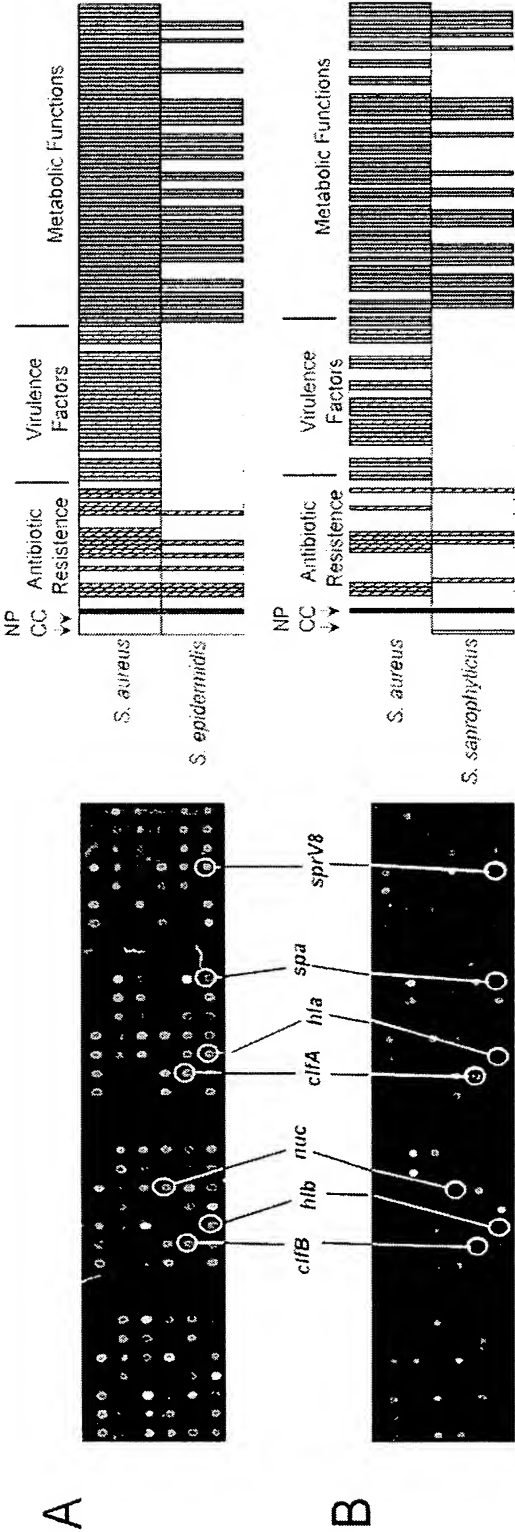


Fig.4

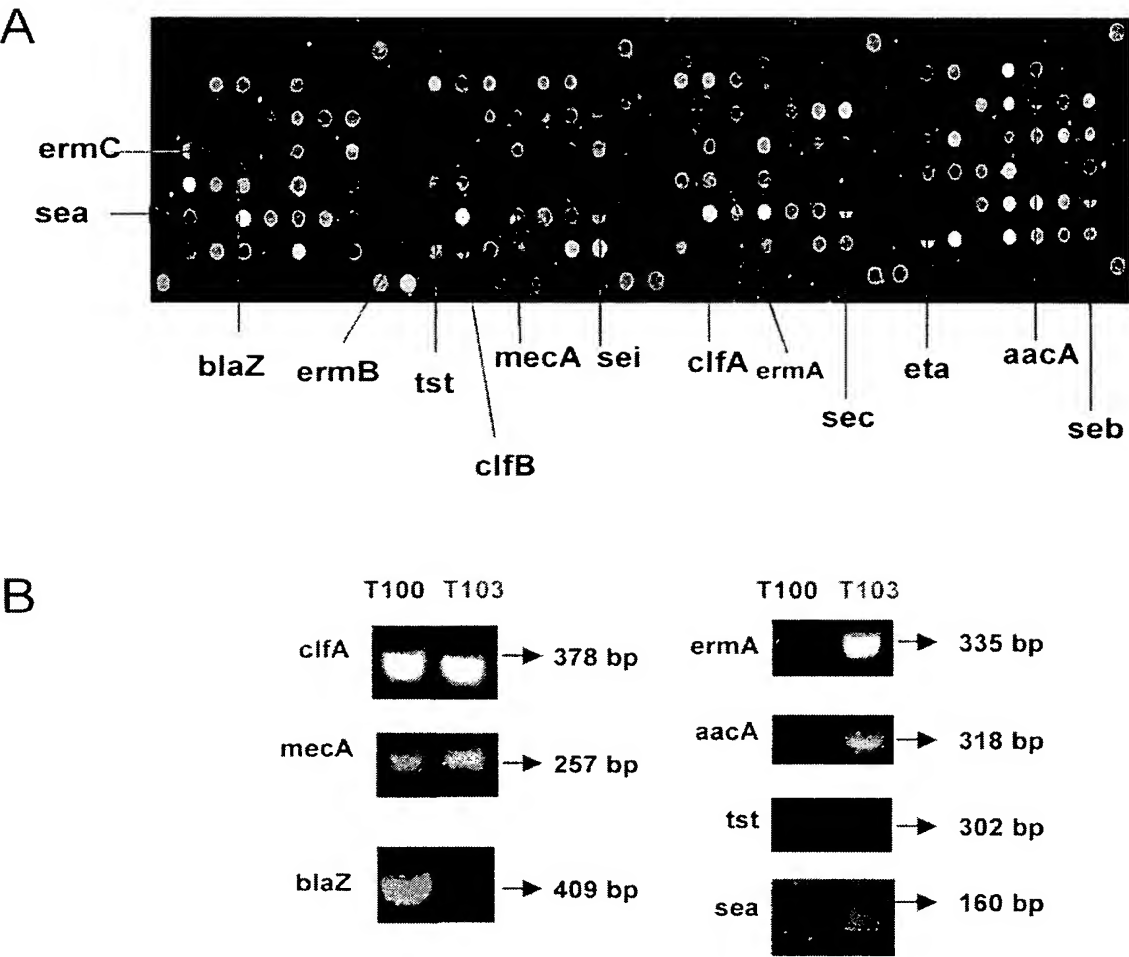


Fig.5

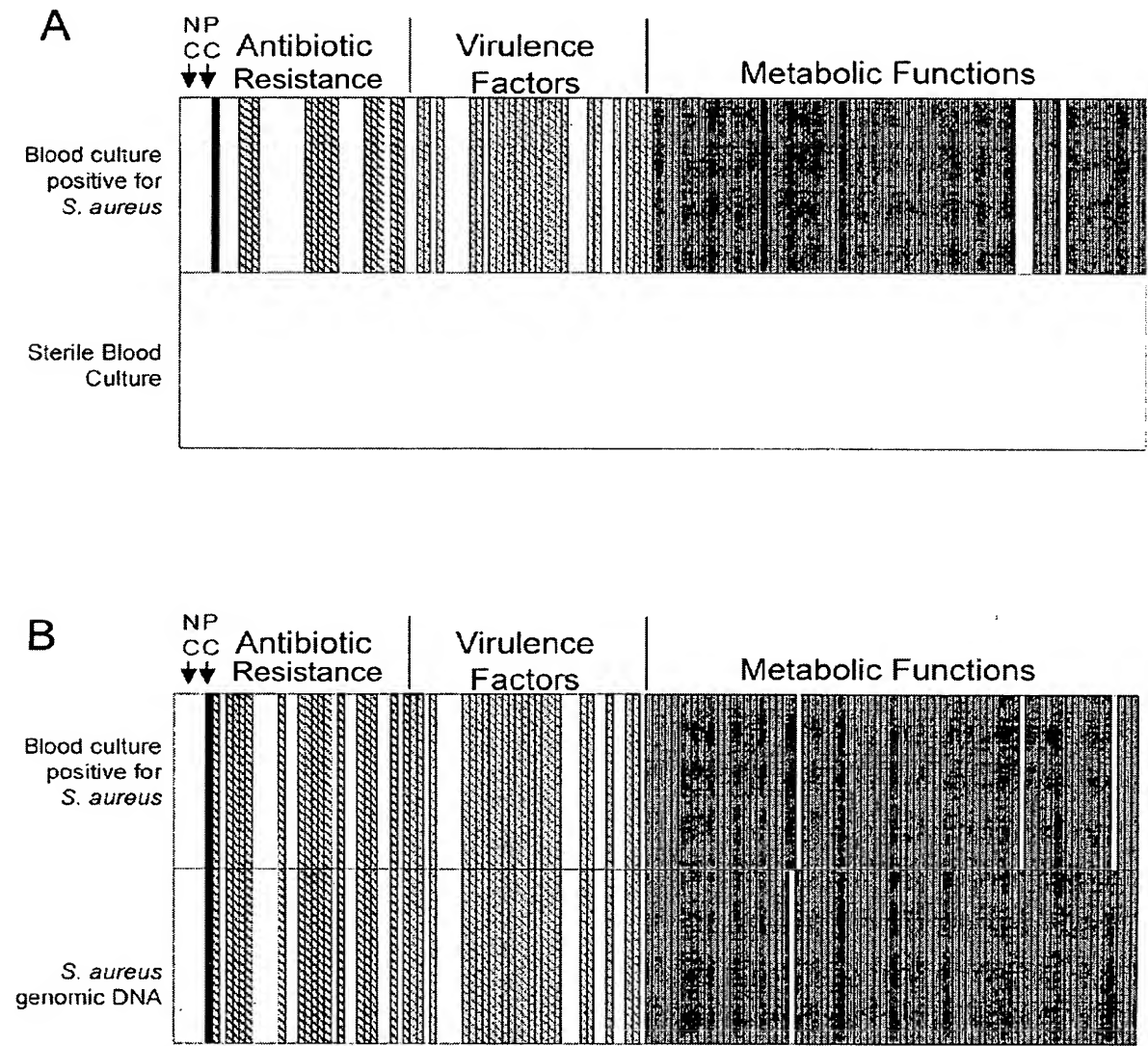


Fig.6

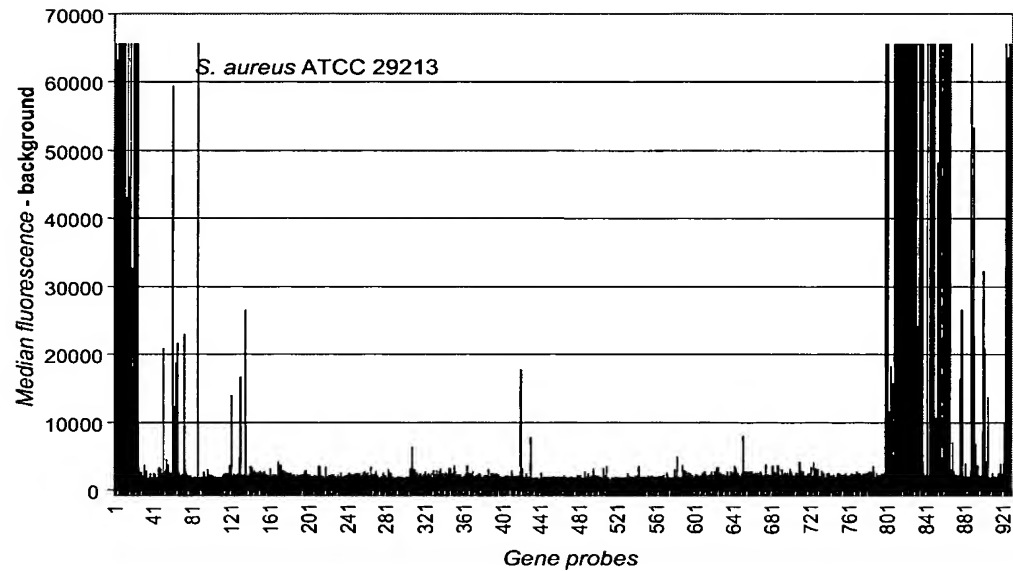


Fig.7A

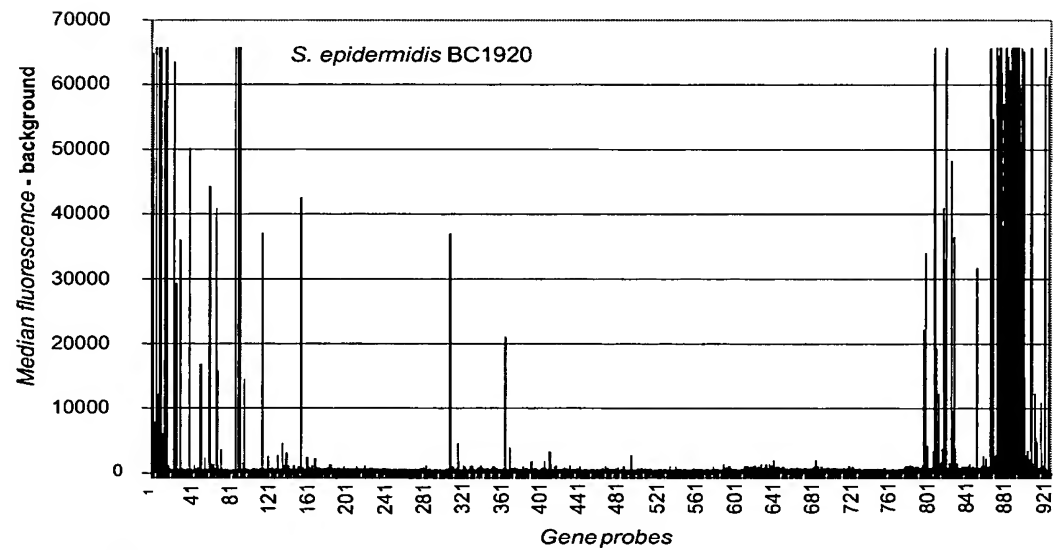
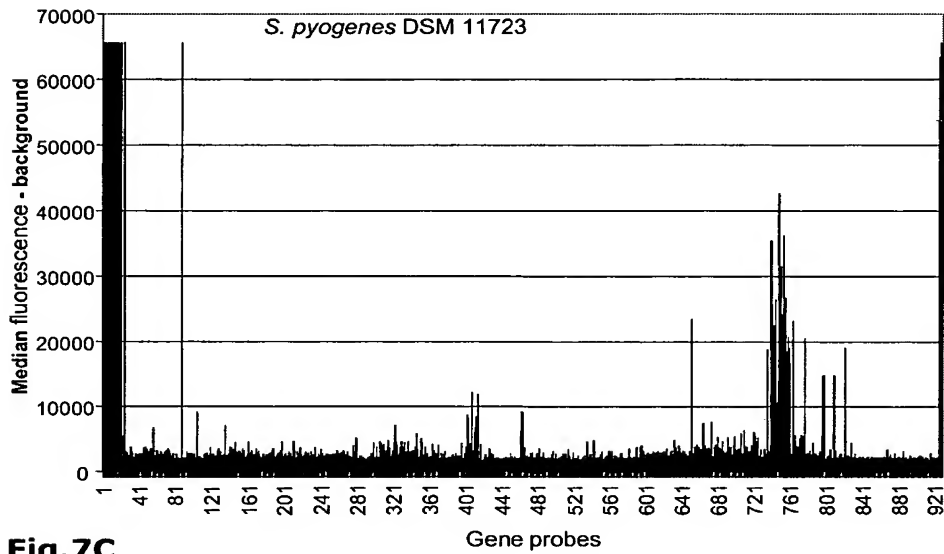
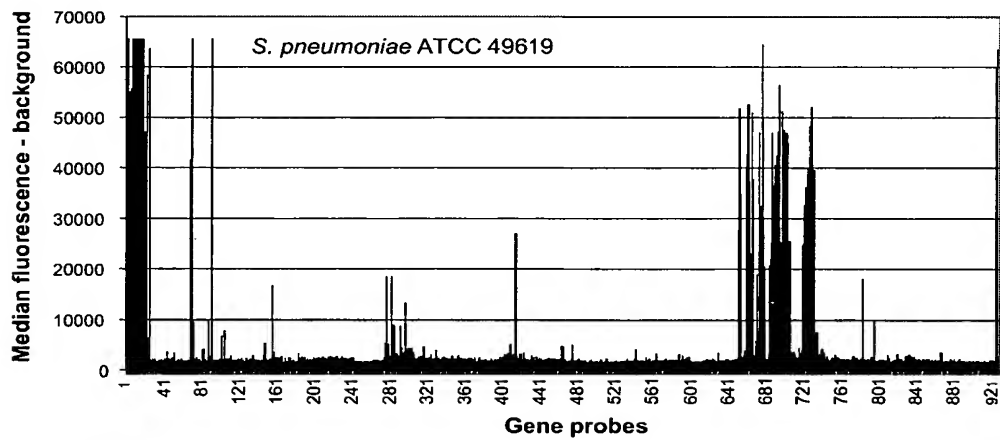
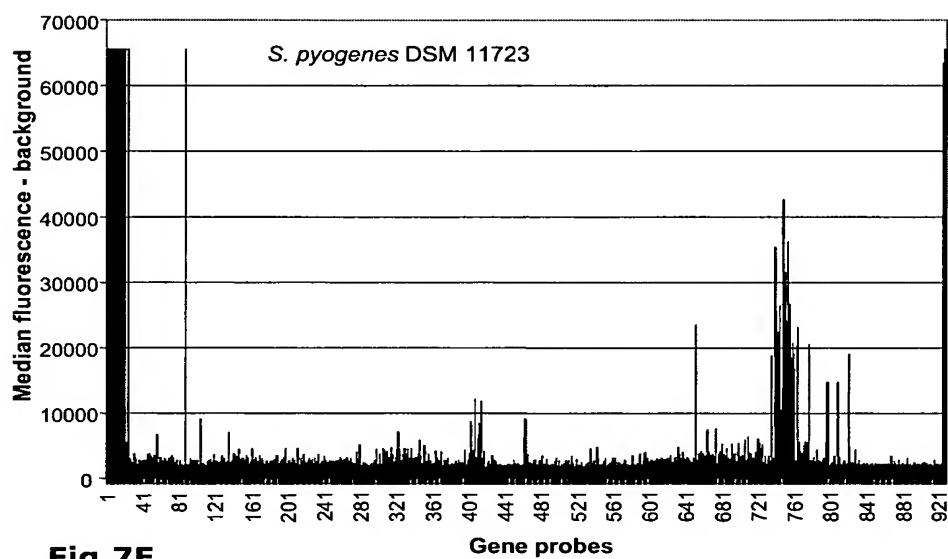
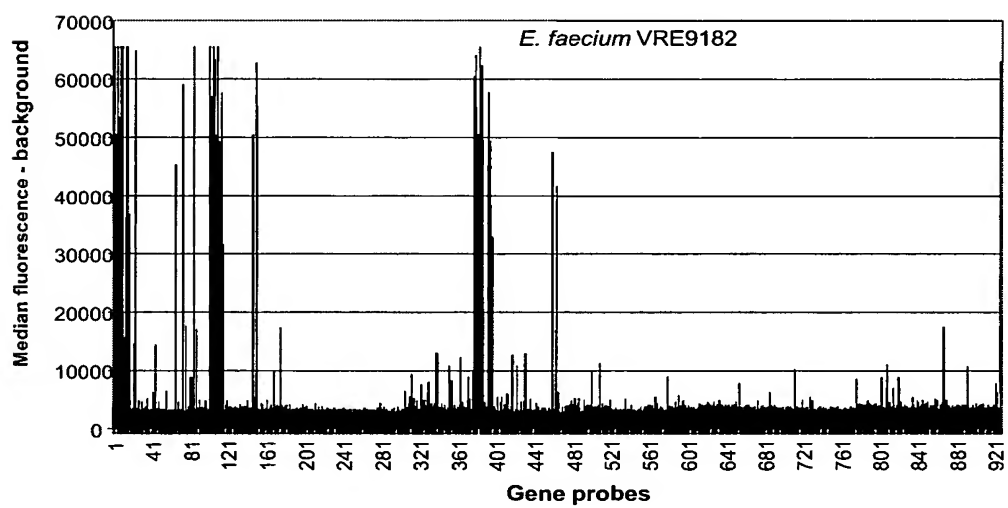
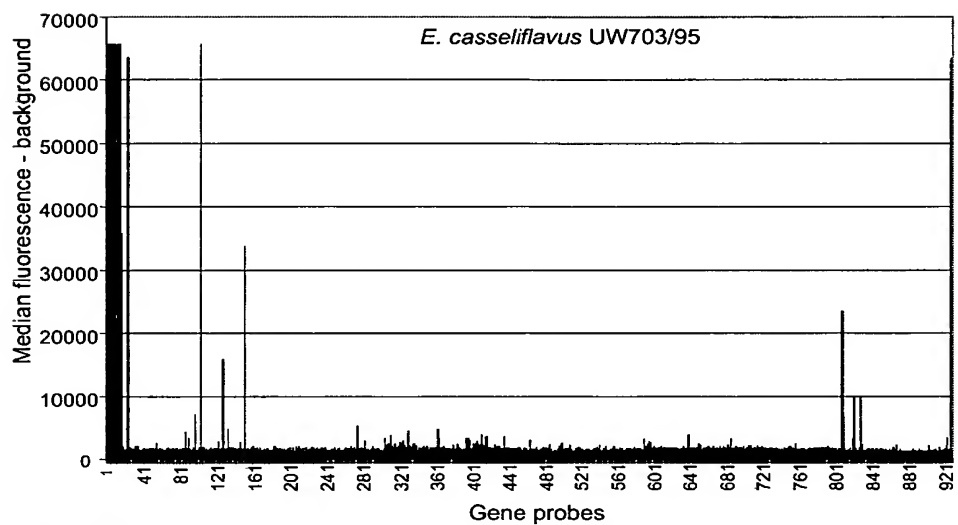
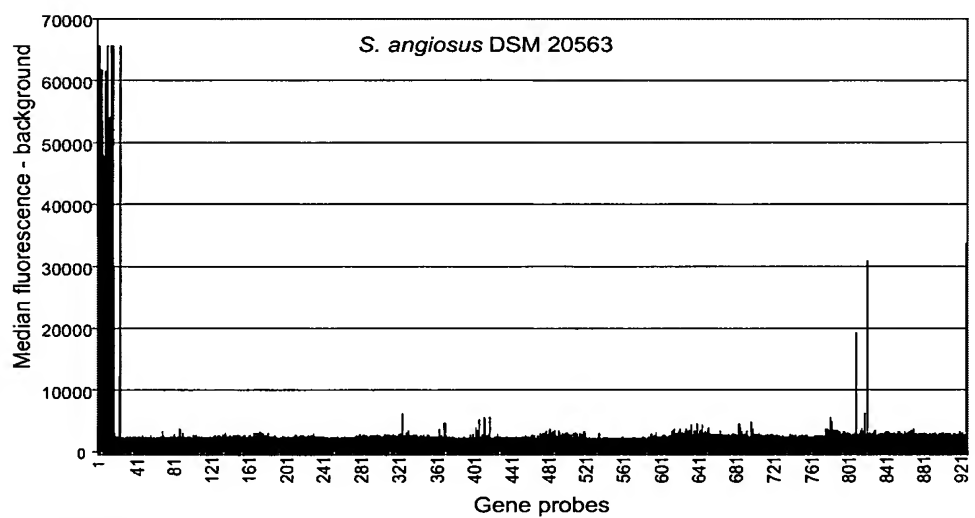
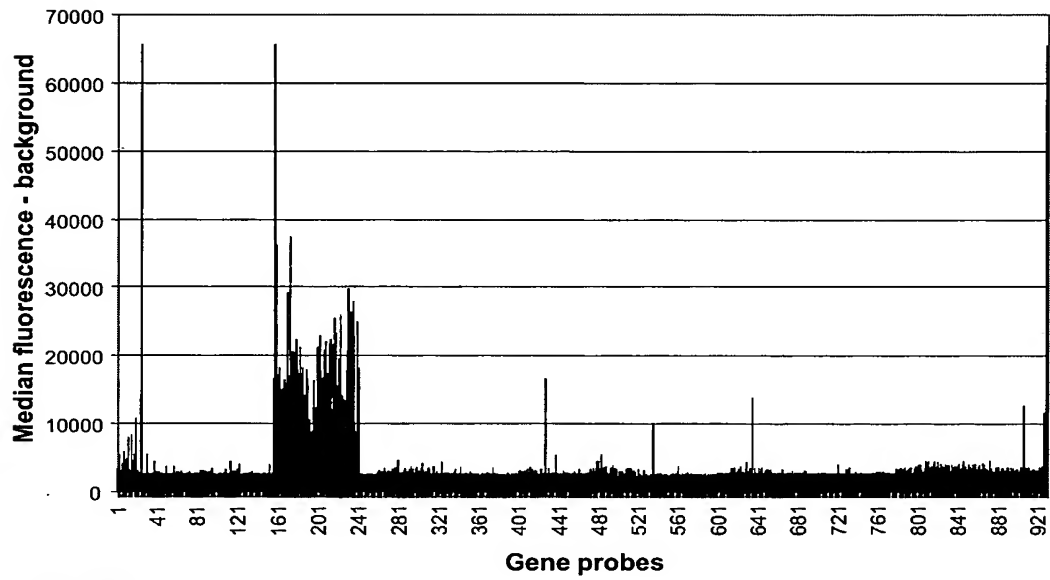
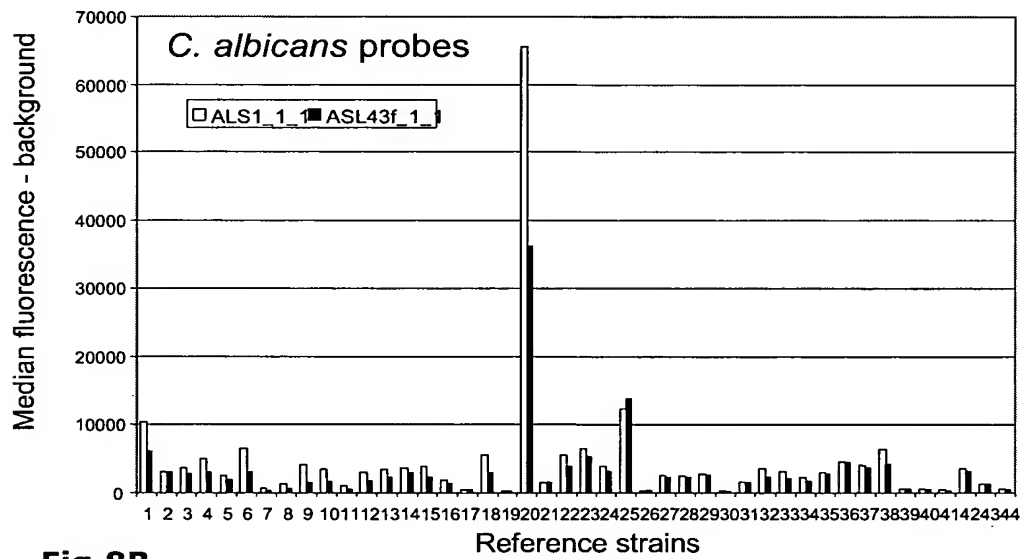


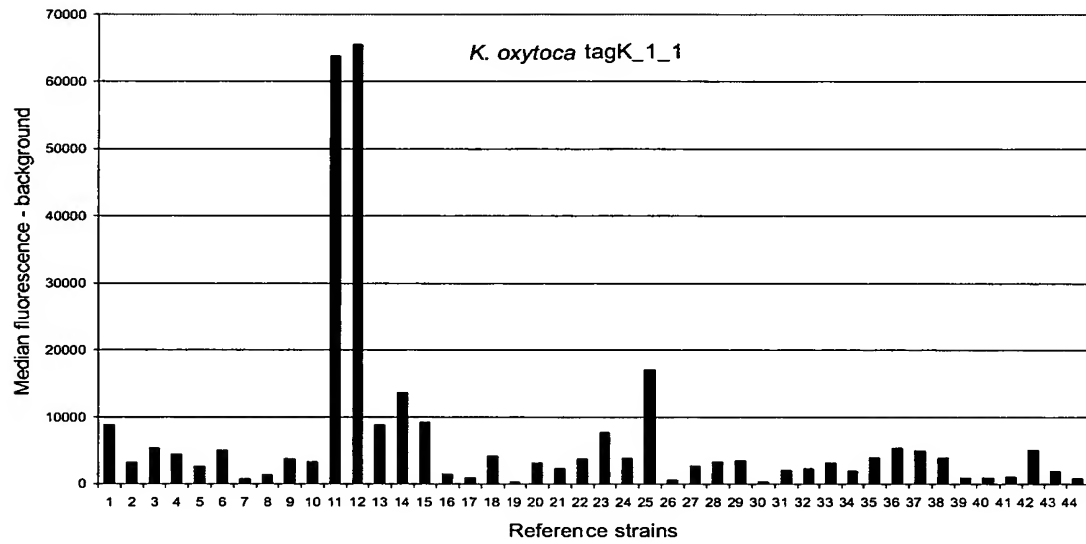
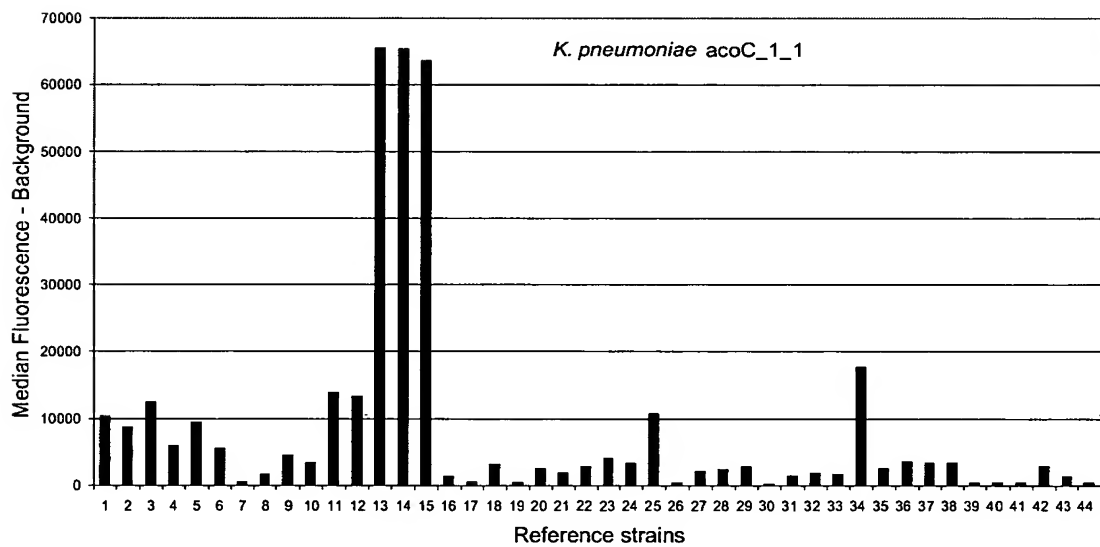
Fig.7B

**Fig.7C****Fig.7D**

**Fig.7E****Fig.7F**

**Fig.7G****Fig.7H**

**Fig.8A****Fig.8B**

**Fig.9A****Fig.9B**

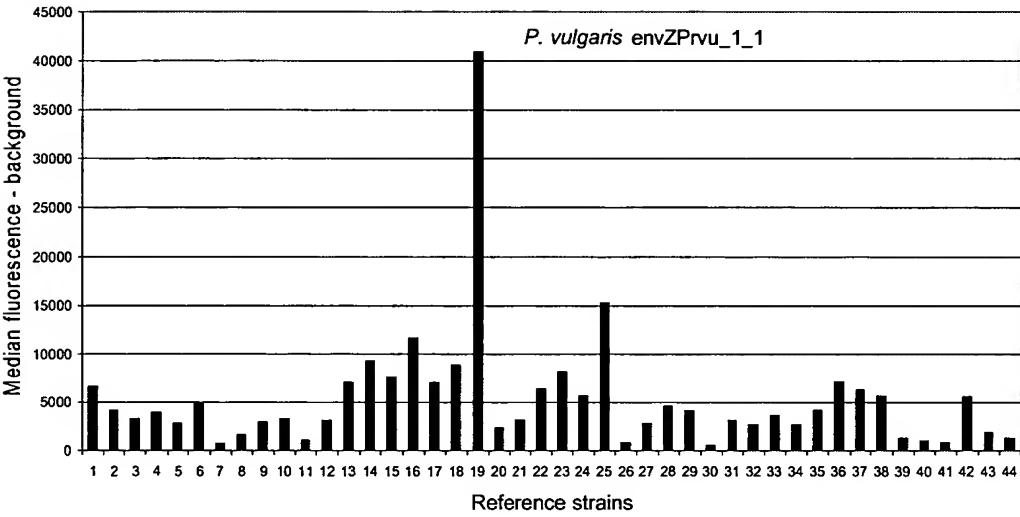


Fig.9C

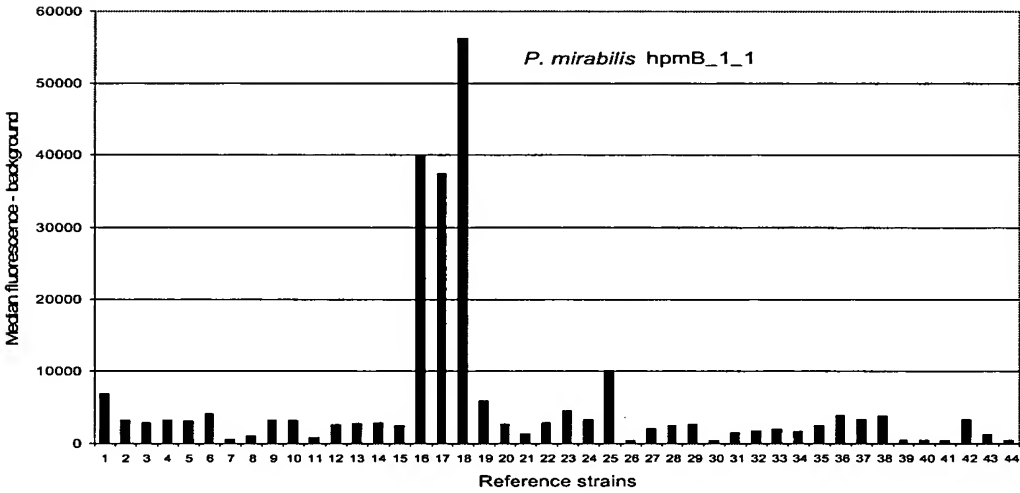


Fig.9D

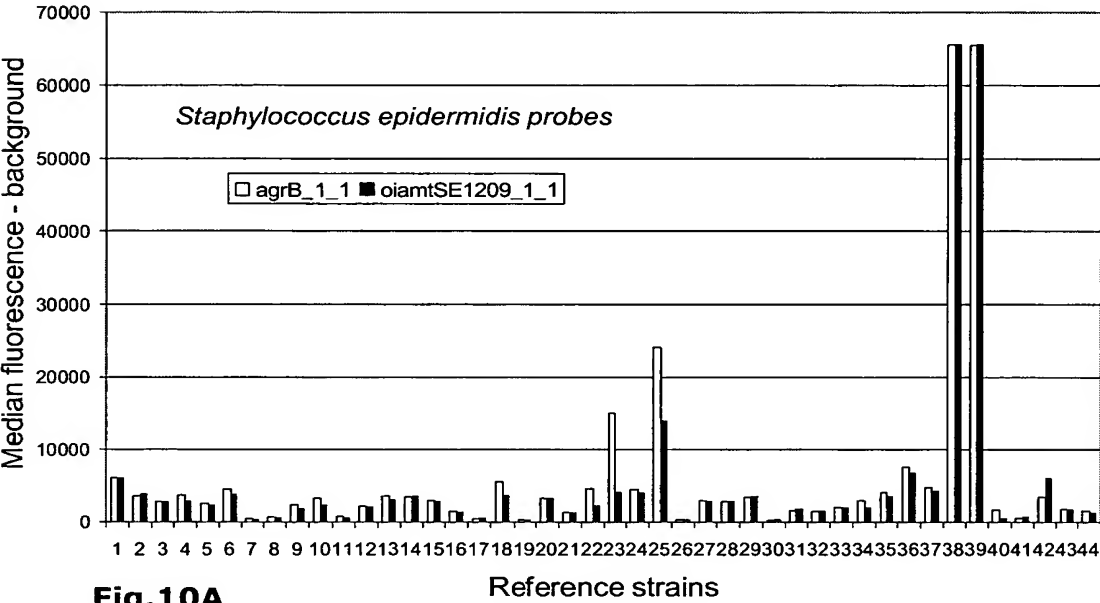


Fig.10A

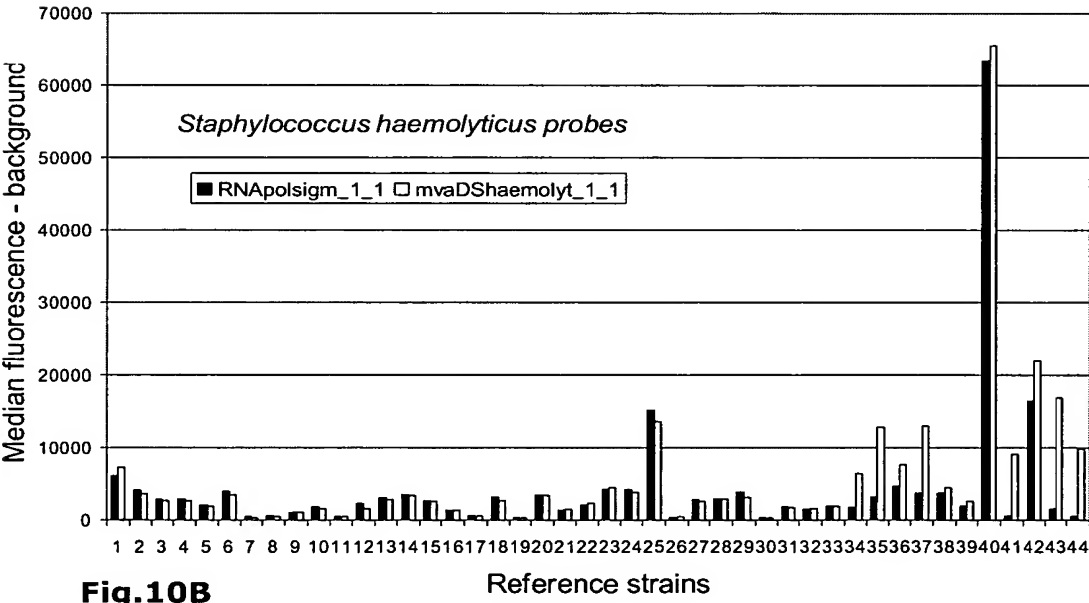


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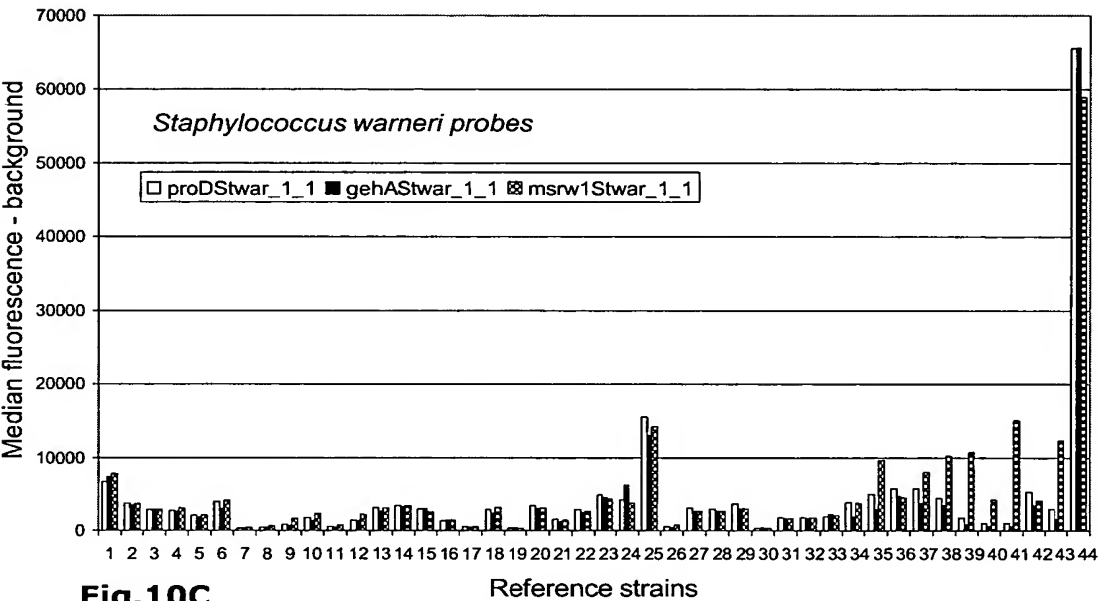


Fig.10C

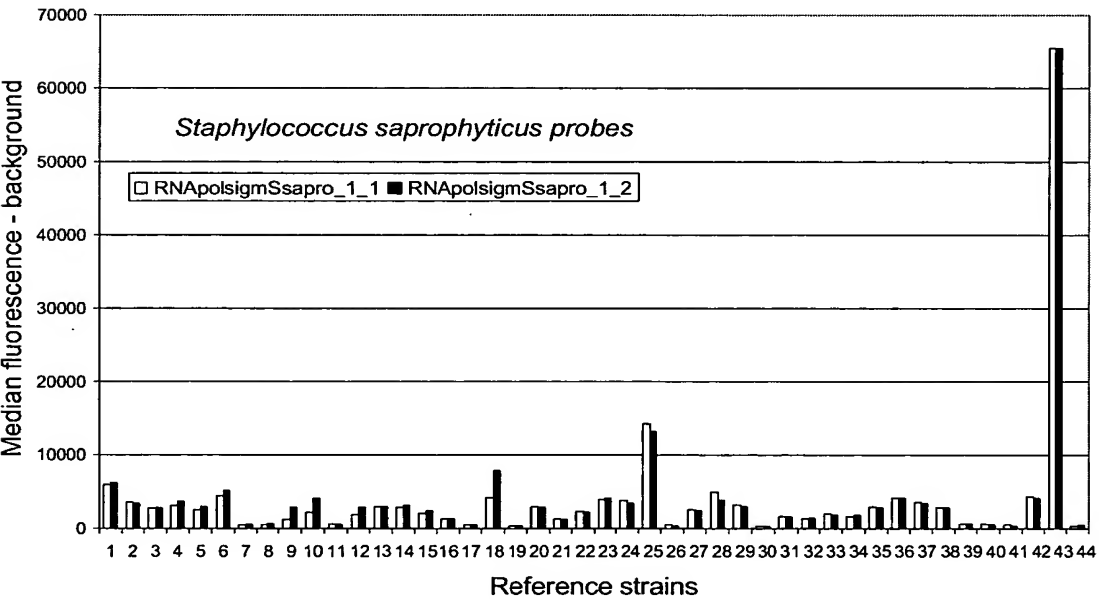


Fig.10D

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<120> analytical device for rapid identification of pathogens

<130> 062148wo/JH/PCH

<150> EP 05109025.6

<151> 2005-09-29

<160> 3042

<170> PatentIn version 3.3

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<210> 11
 <211> 336
 <212> DNA
 <213> Staphylococcus aureus

<400> 11
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 aatatccgac attacctgtt ggcgttgaaa gaccaggcgc aagattatct actacagatg 180
 aagggtgaact tgttatcgaa ggtcaaagtg taagttagg atacttaaaa aatgaccaa 240
 aaacagctga agtatttaat ttcgatgacg gtattcgtac atatcacact ggtgataaag 300
 cgaagtttga aaatggtcaa tggttcattc aaggtc 336

<210> 12
 <211> 340
 <212> DNA
 <213> Staphylococcus aureus

<400> 12
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 tgttaatctt ttcttctgat aaacataatc tgtttgacca aaagtattta agtgttcaat 180
 taattagttt tattattttac gtcgtatggc aagttttatt gataatgttt tattatcatt 240

caaaacaaaa aaataattca ttttcaaaat ttgtaactgt aatggtttta tcaatattgc 300
cattagcact tgtgaaagtg ttacaaagta catggttagg 340

<210> 13
<211> 210
<212> DNA
<213> Staphylococcus aureus

<400> 13
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taaacttgat atcgaagtat ctattatgga ctttgataga gatgagtggg caacacaaaa 180
taaaatcggt gaagcattag aagagttacg 210

<210> 14
<211> 262
<212> DNA
<213> Staphylococcus aureus

<400> 14
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taaaactgct ttagaaggtc aagatataga agatattaaa tctaaaaaag aagaacttga 120
aaaagtgatt caagaattat cagcaaaagt atatgagcaa gcggctcaac agcaacaaca 180
agcacaaggt gcaaatgctg gtcaaaacaa cgatagtact gtagaagatg ctgaatttaa 240
agaagtaaaa gacgacgaca aa 262

<210> 15
<211> 224
<212> DNA
<213> Staphylococcus aureus

<400> 15
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atcgcattat ttggtggtat ctttgttatc aatgctttat taagcggatt aggtttatat 180
ttattaagta aaattggtga aaagattatt tatgcgatac gctc 224

<210> 16
<211> 435
<212> DNA
<213> Staphylococcus aureus

<400> 16
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 gagttaggtg taatgatttc agcctctcat aatccagttg cagataatgg tattaatttc 180
 tttggatcag atgggtttta actatcagat gaacaagaaa atgaaattga agcattattg 240
 gatcaagaaa acccagaatt accaagacca gttggcaatg atattgtaca ttattcagat 300
 tactttgaag gggcacaaaa atatttgagc tattttaaata caacagtaga tgttaacttt 360
 gaagggttga aaattgcttt agatggcgca aatgggtcaa catcatcact agcgccattc 420
 ttatttggtg actta 435

<210> 17
 <211> 426
 <212> DNA
 <213> Staphylococcus aureus

<400> 17
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 tacagcggta tgtaacccat tagtaaaactc atacaaacgt ttagttcctg gttatgaagc 360
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 aagagg 426

<210> 18
 <211> 339
 <212> DNA
 <213> Staphylococcus aureus

<400> 18
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 cggatttaac gccaaaggcaa atacgttact atgaaacaca tgaactcatc aaacctgaaa 120
 gaacagaagg tcaaaaacgt ctgttctcac tcaatgattt ggaaagatta ctagaaatta 180
 aatcattatt agaaaaagga tttaatatca aagggattaa acaaatcatt tatgactcac 240

aagagcattt aacaacagat gaacaagaga taagaaaaa gatgattgta gatgccacgc 300
aaaagcctat tggagaaact ttgccaataa atcgtggtg 339

<210> 19
<211> 390
<212> DNA
<213> Staphylococcus aureus

<400> 19
ttgaatcacc aaattgaggt tgttgcaaat agaacgaagt ttgaattaga taatgcagaa 60
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gaattgattc gtagctctaa aaacaagcgt gacgctaaag aaaaccttat cgaagtatac 180
gagttcacag aagaacaggc tgaagcaatt gtaatgttac agttatatcg tttaacaaac 240
actgatatag ttgcgcttga aggtgaacat aaagaacttg aagcattaat caaacaatta 300
cgtcatattc ttgataacca tgatgcatta ttgaatgtca taaaagaaga attgaatgaa 360
attaaaaaga aattcaaata tgaacgactg 390

<210> 20
<211> 415
<212> DNA
<213> Staphylococcus aureus

<400> 20
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atgacacaat ttttaaagca tctacatcat ttaattttga tgttttaagc gaacgactac 180
aagagtctgc gttcttattg aaaaatttaa aaataacgct taatgattta cgcagtggta 240
aagagcgtca agagcattac cattatgaag aaggaatcaa agagtgtgtt agttatgtca 300
atgaaggaaa agaagttttg catgacgtgg ctacattttc aggtgaagca aatggtatag 360
aggtagacgt agctttccaa tataatgatc aatattcaga aagtatttta agttt 415

<210> 21
<211> 206
<212> DNA
<213> Staphylococcus aureus

<400> 21
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atatcttacc tttattagaa caagtgggtc aatctaatacg tccaatctta attgtagctg 180
atgaagttga aggcgatgca ttaaca 206

<210> 22
<211> 380
<212> DNA
<213> Staphylococcus aureus

<400> 22
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ttcattttaat accagatatg tttcattatc tcgtttaact tctgtaccag catattgttg 120
gaacacgaca cgggccctt ctttcacttc aggagtcact cttgtaccat catttaatag 180
gcgtccagtt cctactgcaa cgataacgcc ttcgtttgat ttttctttag cactatcagt 240
taaaacaata ccacttttag ttgtttgttc ttgttctttt ttctcaataa tcacacgatt 300
tccaattggg tttagcatga ttgttcctcc ttaaaaaacc taaagtttag cacttaacat 360
taaagagtgc taacatacat 380

<210> 23
<211> 496
<212> DNA
<213> Staphylococcus aureus

<400> 23
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taaagcaatg tcagaagtaa aagtggggga cgaagcagta gaacatttat tgcgtgtcac 180
ttctggttta gattcaatcg tacttggaga aactcaaatt ttaggtcaaa taagagatgc 240
atttttctta gcgcaaagca caggtacgac aggaacaatt tttaatcatc tatttaaaca 300
ggcaattact tttgcaaaaa gagcacataa tgaacagat atagctgata atgctgtaag 360
tgtgtcttat gctgcggtcg agttggcgaa aaaagtatct ggcaaattga aaagtaagca 420
agctatcatt attgggtgcag gggaaatgag tgaattatca ctattaaatc ttcttgggtc 480
tggaattact gatatt 496

<210> 24
<211> 619
<212> DNA
<213> Staphylococcus aureus

<400> 24
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 cagccggagt tgtgcgctta tgtaacacat ttaccagttg ataattatca tacagatgca 180
 gcaattttat acaaagatat tatgacacca ttaaagccaa ttggtgtcga tgtagaaatt 240
 aaatcgggta ttggtccagt gattcataat ccaatcaaaa caattcaaga tgtagagaaa 300
 ctttctcaaa tagaccccg aagagatgta ccatatgtat tagatacaat taaactttta 360
 acagaagaaa agttaaatgt gccgctaata ggatttactg gggcaccatt tacattagcg 420
 tcatatatga ttgaaggcgg accatcgaaa aattacaatt ttacaaaagc gatgatgtat 480
 agagatgaag caacatggtt tgctttaatg aatcathtag ttgatgtatc tgtaaatat 540
 gtaacagctc aagtccaagc aggtgccgaa ttgattcaaa ttttcgattc atgggtaggt 600
 gcattaaatg tcgaggatt 619

<210> 25
 <211> 578
 <212> DNA
 <213> Staphylococcus aureus

<400> 25
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 tagatatgaa tttatagggtg gtttatcacc attagcaggt acaacagatg accaggctga 180
 tgcgctagtt tcagcattaa ataaagcata tgcagatgtt gaatttaaac tatacttagg 240
 attaaaacac atttcacat ttatcgaaga tgcggttgaa caaatgcaca atgatggcat 300
 tactgaagca atcacggtag tactagcacc acattattct tcattttcag taggatcata 360
 tgacaaacgt gctgatgaag aagctgcaaa atatggtatt caacttacac atgtgaaaca 420
 ttattatgaa caacctaaat ttattgaata ttggacgaat aaagtcaacg aaacattagc 480
 tcaaataccg gaagaggaac ataaagacac ggtattagtt gtttcggcac atagtttgcc 540
 aaaaggttta atcgaaaaga ataatgatcc atatccac 578

<210> 26
 <211> 382
 <212> DNA
 <213> Staphylococcus aureus

<400> 26
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 ggtaaagggt caaaaattta tgatatcgat ggtaacgagt atatcgacta tgtactaagt 180
 tggggggccac ttatttttagg acatagagac cctcaagtta ttagtcattt acatgaagca 240
 attgataaag gtacaagttt tgggtgcatca acattacttg aaaataaatt ggcgcagctc 300
 gttattgacc gagtaccttc aatagaaaaa gtgcgtatgg tgtcatctgg tacagaagct 360
 acattggata ctttaagatt ag 382

<210> 27
 <211> 1099
 <212> DNA
 <213> Staphylococcus aureus

<400> 27
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 acaaatacga ctggacaatc atatattttt gcgaaaaaca aattgtatcc tattccaggt 240
 ggatcaatta tgggaattcc gacagatatc aaaccgtttg tgacaactaa attaatattca 300
 ccacttggtg aattaagagc aggattagat ttaatcaaaa agcctataca aatgcaagat 360
 ggtgacattt ctgttggtgc atttttcaga gcaagattag gtaatgaggt acttgagaat 420
 ttaatagagc ctttaatggg tggatatttat ggtaccgata ttgataaatt aagtttgatg 480
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 caattcaaac aatttaagca tggtttaagt tcatttattg aagcattaga acaagatgtg 660
 aaaaataaag gtgtgacaat acgctacaat acgtcagtgg atgatattat tacatctcaa 720
 aagcaatata aaattgttta cagtaatcaa caagaagatg tattcgatgg ggtattagtg 780
 acaacaccgc atcaagtctt tttgaattgg ttcggacaag atccagcatt tgattacttt 840
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cgtgcgtatg taggtaaacc aggtgatact gtggttgatg atcatcacaga taatgaatta 1080
 gtatcgattg tacgtagag 1099

<210> 28
 <211> 629
 <212> DNA
 <213> Staphylococcus aureus

<400> 28
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 atgataggtt tagaccaaga cgatgttggt ttagcaagtg ctaaactctaa cattggaatt 120
 gaagagatac tagagaaaat agttgaagtt gtgccagctc cagatggcga cccagaagca 180
 ccactaaaag cgtaaatatt tgattctgag tatgatccat atagaggggt aatttcatcg 240
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 aaagagttcg aagtaacaga agttggaatt aatacaccta agcagcttcc agttgatgaa 360
 ttaacagttg gtgatgttgg ttatattatt gcaagtatta aaaatgttga tgattctagg 420
 gttggtgaca ccatcacatt agctagtaga cctgcacag aaccattgca aggttataag 480
 aaaatgaatc caatggtata ttgcggactg ttcccaatag ataacaaaaa ttataatgat 540
 ttaagagaag cattagaaaa attacaattg aatgatgcat cattagaatt tgagcctgaa 600
 tcgtcacaag cattagggtt tggttatag 629

<210> 29
 <211> 265
 <212> DNA
 <213> Staphylococcus aureus

<400> 29
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 ttagtattat tatttgtatt attatgtact ggtgctgtta agttaggcga agtcgaaaaa 180
 gtaggaacga cactaacaaa taacattggc ttactcttcg taccagccgg tatctcagtt 240
 gttaactcct taggtgtcat tagcc 265

<210> 30
 <211> 278
 <212> DNA
 <213> Staphylococcus aureus

<400> 30
 gattaaccac ttagcactaa atacacctta cttcggaata ctgttatccg ttataaccatt 60
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 tgtcagtatg gtatttggtg tggccttcct ctatttaaca ggcattccgt ataagactta 180
 caaaataggt ggagacatta ttactttctt cttagaaccg gcaacaatct gttttgcgat 240
 tccgttatat aaaaagcgtg aagtgccttg taaacatt 278

<210> 31
 <211> 388
 <212> DNA
 <213> Staphylococcus aureus

<400> 31
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 gtacttatta tacaattgat tctaattggg attatcatca cacacctgat ggtaactgga 120
 atcaagcaat gtttgataat aaagaatata gctatacatt cgtagatgct caaggacata 180
 cgcattatit ttataactgt tatccaaaaa atgcaaatgc caatggaagc ggccaaacat 240
 atgtgaatcc agcaatagca ggagataaca atgactacac agcgagtcaa agccaacagc 300
 atattaatca atatggttat caatcaaag taggtccaga cgcgagctat tattcacata 360
 gtaacaacaa ccaagcgtat aacagcca 388

<210> 32
 <211> 203
 <212> DNA
 <213> Staphylococcus aureus

<400> 32
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 cagcgtttta ttctgtattat tccaaaaccg gttatcgcga tggtaaaagg ttatgctgta 180
 ggtggcggta atgtactaaa tgt 203

<210> 33
 <211> 1434
 <212> DNA
 <213> Staphylococcus aureus

<400> 33
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agcacatcca aatattaaaa catggataca ccccgatgag cgaagtgcag cattttttgc 120
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taaagagacc attaatgcaa tttattatca aatgcaaatt gctagtcaat atttatatgg 420
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gaacaacgat ggtggcggta ttttttcata tttaccacaa aaagaaagtg caactgacta 1380
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<210> 34
<211> 1149
<212> DNA
<213> Staphylococcus aureus

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<400> 34
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 gctgaaata 1149

<210> 35
 <211> 236
 <212> DNA
 <213> Staphylococcus aureus

<400> 35
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 gatatatatg atgattgtga atttattggt gcaattcggt cgatgcttat taagaaagca 180
 caagcaactt tatttgctgg gtgtggcatt gttaaagatt ctgatccaga tagtga 236

<210> 36
 <211> 327

<212> DNA
<213> Staphylococcus aureus

<400> 36
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ggatatactt tcggtatggt ttacttact attatgcaa cactagtatt tattaatcca 180
atgtgggttg gaatcttatt cgcaatagta ggtgcgcttc taattgaaa attaagaacg 240
tcatacactg cttaccaaga aattgctatt ccaattataa tgagtgtggt tatcgccttg 300
agtgcattct tcatttcatt agctgat 327

<210> 37
<211> 195
<212> DNA
<213> Staphylococcus aureus

<400> 37
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catcatttta tctgtgaaaa gtgtggagat acaaaggtta tagattattg tccaatagat 120
cagataaagt tatcactacc tgggtgttaat attcacaaac acaaacttga agtttatggt 180
gtatgtgagt cttgc 195

<210> 38
<211> 313
<212> DNA
<213> Staphylococcus aureus

<400> 38
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cgaaaacgtc tgaaagttaa atagctgatg atgaatcttc cggttataat aatacacgtg 180
aaaaagatga agactacttc aaaaagcaac aagaaattct acaagaaatg gatcaaacaat 240
ttgattcgaa tgacgatata tctgtgcaaa attatgagaa taaagcgtct gatgattatt 300
atgatgtaaa cga 313

<210> 39
<211> 322
<212> DNA
<213> Staphylococcus aureus

<400> 39
 ttgtaattca ctttaacttca ccaatgcctc aattgggtgc atattagata aattcaaatt 60
 ttttaatttgt agttcaatct cgcttttcttg atcatttttca aacaaatcaa atgatgcttg 120
 ttcaaagtct ttttgagata aagtatcagt tgttttcttca acacttaagt ttaaattttc 180
 ttgattaatt tcaggttcat tttcgaccat ttttaaattt gatatcgatg attttttacc 240
 agcagacgct tcaaactcgc ttagaatcac ttgtgctctg ctaataactt tttcaggtaa 300
 atcagctaatt ttcgcaactt ga 322

<210> 40
 <211> 432
 <212> DNA
 <213> Staphylococcus aureus

<400> 40
 actcaaacag ttagcaagat tgctcaagtt aaaccaaaaca aactgggtat tcgtgcttct 60
 gtttatgaaa aaacagcgaa aaacgggtgcg aaatatgcag accgtacggt ctatgtaaca 120
 aaagagcgtg ctcatggtaa tgaaacgtat gtattattaa acaatacaag ccataacatc 180
 ccattagggtt ggttcaatgt aaaagactta aatgtttcaa acttaggcaa agaagttaa 240
 acgactcaaa aatatactgt taataaatca aataacggct tatcaatggt tccttgggggt 300
 actaaaaacc aagtcatttt aacaggcaat aacattgctc aagggtacatt taatgcaacg 360
 aaacaagtat ctgtaggcaa agatgtttat ttatacggta ctattaataa ccgcactggt 420
 tgggtaaatg ca 432

<210> 41
 <211> 353
 <212> DNA
 <213> Staphylococcus aureus

<400> 41
 ggtgttccaa actcaaaaga tgatataggt actggtgcat acattcacga tgggtgttatt 60
 caacaggcaa cacgtattgc taataaaatg tatgatgact tattaattgt tgcagacact 120
 tgtttatgtg aatatactga tcatgggtcat tgtggcgtga ttgatgacca tacacatgac 180
 gttgacaatg ataaatcatt gccactgctt gttaaaacag caatttctca agtggaaagct 240
 ggtgctgata ttattgcgcc aagtaatatg atggatgggt ttgttgctga aattcgctgt 300
 ggattagatg aagccggcta ttacaatatt cctataatga gttatgggtgt caa 353

<210> 42
<211> 399
<212> DNA
<213> Staphylococcus aureus

<400> 42
aacacaatcg gaaatgttgg atacggctga aaagttatca aagctaatca agatggatac 60
taagaaaatt acagaacgtg ataagaaaga tttctggatt cagttgcatc ctaaaaaagc 120
aaaagcaatg atgacaaaag aacaagctat gttagcagat ggaagtatta aacaagatca 180
atatgataaa caactgttat cgaaaatcag aaaatcacia ttagatgaat tgtcttctaa 240
agatttacaa gtttttagcta tttttcgaga gatgaatgca ggaacagttt tagatccaca 300
aatgataaaa aatgaagatg tcagtgaaaa agagtatgca gcagtttctc agcaactttc 360
caaattacca ggtgttaaca cgtctatgga ttgggatag 399

<210> 43
<211> 329
<212> DNA
<213> Staphylococcus aureus

<220>
<221> misc_feature
<222> (56)..(56)
<223> n is a, c, g, or t

<220>
<221> misc_feature
<222> (71)..(71)
<223> n is a, c, g, or t

<400> 43
tgacatttca aatcaatcac atcggtgcaa atggttcaag aatcaaatg aaagcncgca 60
gaagaacttg naaaaagatg gttattctgt tgaagtaatt gacttacgta ctgttcaacc 120
aatcgatgtt gatacaattg tagcttcagt tgaaaaaact ggtcgtgcag ttgtagttca 180
agaagcacia cgtcaagctg gtgttggtgc agcagttgta gctgaattaa gtgaacgtgc 240
aatcctttca ttagaagcac ctattggaag agttgcagca gcagatacaa tttatccatt 300
cactcaagct gaaaatgttt gggtaccaa 329

<210> 44
<211> 303
<212> DNA
<213> Staphylococcus aureus

<400> 44
 ctggagatac tattgaagaa gacgatgttt tagctgaggt acaaaacgat aaatcagtag 60
 tagaaatccc atcaccagta tctggtactg tagaagaagt tatggtagaa gaaggtacag 120
 tagctgtagt tggtgacggt attgttaaaa tcgatgcacc tgatgcagaa gatatgcaat 180
 ttaaagggtca tgatgatgat tcatcatcta aagaagaacc tgcgaaagag gaagcgccag 240
 cagagcaagc acctgtagct actcaaactg aagaagtaga tgaaaacaga actgtaaaag 300
 caa 303

<210> 45
 <211> 302
 <212> DNA
 <213> Staphylococcus aureus

<400> 45
 tagttatcga gattatcaaa gattggtaga taaacttcaa gttcacgata aagagataga 60
 cttagcttct agcttacaac aaacaatgct taaaacagat attccacaat ttgatagtat 120
 tcaaattggc gttattttcag tggcggcaca aaaagtaagt ggagattatt ttaatttaat 180
 tgaccataac gatggcacia tgagctttgc tgttgagat gtcattggaa aaggtatacc 240
 agctgcttta gcaatgagta tgataaagtt tggcatggat tcttatggac actcacaatt 300
 ac 302

<210> 46
 <211> 254
 <212> DNA
 <213> Staphylococcus aureus

<400> 46
 tgaatcttaa tatagaaaca accactcaag ataaatttta cgaagttaaa gtcggtggag 60
 aattagatgt ttatactgtg cctgaattag aagaggtttt aacacctatg agacaagatg 120
 gaactcgtga tatttatggt aatttagaaa atgtgagtta tatggattcg acaggtttag 180
 gtttattcgt aggtacatta aaagcattaa accaaaatga taaagaacta tacatttttag 240
 gtgtgtcaga tcgt 254

<210> 47
 <211> 191
 <212> DNA
 <213> Staphylococcus aureus

<400> 47

tctaaagaag attttatcga aatgcgcgtg ccagcatcgg cagagtatgt aagtttaatt 60
 cgtttaacac tttctggcgt tttttcgaga gctggtgcta catatgatga tattgaagat 120
 gccaaagattg cagttagtga agctgtgaca aatgcagtta aacatgcata caaagaaaat 180
 aacaatgtag g 191

<210> 48
 <211> 204
 <212> DNA
 <213> Staphylococcus aureus

<400> 48
 tgagatagat gcaatcatgt ttatggttaa tgccaatgag gaaattggac gaggtgatga 60
 atatattata gaaatgttga aaaatgttaa gacaccagta tttttagtat taaataaaat 120
 agatttagtg catccagatg aattaatgcc aaagattgaa gaatatcaaa gttatatgga 180
 ctttacagag attgtaccta tttc 204

<210> 49
 <211> 234
 <212> DNA
 <213> Staphylococcus aureus

<400> 49
 aatataattg ggaagaagta catcaagaag cagaaatfff agaacatcga atttcagatt 60
 tatttgttga aaggctggat agcctgttaa atttccaga aacttgcccg cacggcggtg 120
 tgattcctag aaataatgaa tataaagaga aatatataac aacgattttg aattatgaac 180
 ctggtgatat cgttacaatc aaacgtgtga gagataagac cgatttgcta atat 234

<210> 50
 <211> 251
 <212> DNA
 <213> Staphylococcus aureus

<400> 50
 ttgaattacc aaaattacca tacgcatttg atgcattaga accacatttt gacaaagaaa 60
 ctatggaaat tcatcatgac agacatcata acacttatgt tacgaaatta aatgctgcag 120
 tagaaggtag agatttagaa tctaaatcta ttgaagaaat tgttgctaatt ttagacagtg 180
 taccagctaa catccaaact gctgtacgta ataatggcgg tggacattta aaccattcat 240
 tattctggga g 251

<210> 51
 <211> 359
 <212> DNA
 <213> Staphylococcus aureus

<400> 51
 gcgcattttg aaaaggcata cttgagaata ctaaagtgtc tgttacaatt aaagaacctt 60
 ctgttgctaa ttttttcatt gtcttgtccc cttatattac aatttgatta catttacatt 120
 atcatagcat tacaaaagaa atgcaacaaa atttttgaat cattacattt ttttataaaa 180
 atttcacttt agattcacia taattactta ttttgtcaat ttatttaatg tcaatatgtt 240
 gattaattaa tagtggtgtc taatgtatat aatatttagg tcatcgttat agtcaacaat 300
 aataagggtat ttcgagttga aatttatctt attatttttc cacttttacg tgctatccc 359

<210> 52
 <211> 438
 <212> DNA
 <213> Staphylococcus aureus

<400> 52
 ttcgttggtc ataggtgcga gtgaactatc aattaaagat ttactacatt taactgagtc 60
 acagcggaat attttattct caagccgaat accaaggacg atgagtattt taattgctgg 120
 aagttcgttg gctttagcag gcttgataat gcaacaaatg atgcaaaata agtttggttag 180
 tccgactaca gctggaacga tggaatgggc taaactaggt attttaattg ctttattgtt 240
 ctttccaacc ggtcataattt tattaataact agtatttgcg gttatttgta gtatttgcg 300
 tacgttttta tttgttaaaa tcattgattt tataaaagtg aaagatgtca tttttgtacc 360
 gcttctagga attatgatgg gtgggattgt tgcaagtttc acaaccttca tctcattgag 420
 cacgagtgtc gttcaaag 438

<210> 53
 <211> 288
 <212> DNA
 <213> Staphylococcus aureus

<400> 53
 tattgcctta tttagatgta ttgcttttag gtcgtgctga agcaattaat ctggggatat 60
 cgtatgaaaa attaacgcga attctacttg taatagtctc agtttttagt tctgtgtcaa 120
 ctgcattagt aggaccaatt acatttttag gtttattaac tgtaaatcta gcgcattgac 180
 taatgaagac gtatgaacat aagtatattt taattgcgac aatttgcttg agttggatta 240

gtttatttag tgcgcaatgg gtagttgaaa atgtgtttga agctacga 288

<210> 54
<211> 431
<212> DNA
<213> Staphylococcus aureus

<400> 54
aatcaaatga tattggaaga tattagcata gatatcgaaa aaggtaaatt gacttcttta 60
attggaccta atgggtcggg taagagtact ttactttcag cgatttgtag gttaattcgt 120
tttgataacg gtgaagtga aatagatgga cggctcatgt ctgattataa aaataatgac 180
ttgtcgaaaa aaatatctat attaaaacaa acaaaccata ctgaaatgaa tattacggta 240
gagcagttgg taaactgtgg acgattccct tattctaaag gtcgtttgac gaaagaggat 300
catgatattg tcaatgatgc gctagatttg ttgcaactac aagatatcag aaatcgtaat 360
attaagtcac tatctggtgg acaacgtcag cgtgcatata ttgcaatgac aatagcacia 420
gatactgaat a 431

<210> 55
<211> 437
<212> DNA
<213> Staphylococcus aureus

<400> 55
catgcggtaa caattctgat aaagaacaat caaaatcaga gactaaaggt tctaaagata 60
cagtgaaaat tgaaaaataac tataaaatgc gtggcgagaa aaaagatggg agtgacgcta 120
aaaaagttaa agaaactgtt gaagtaccaa aaaatcctga aaatgcagtt gtgttagact 180
atggcgcat agatgtaatg aaagaaatgg gcttatcaga caaagtaaaa gcattaccta 240
aaggggaagg cggtaagtca ttaccgaatt tcttagaatc atttaaagat gataaatata 300
caaacgttgg taattttaaa gaagtgaatt ttgataaaat tgctgcgacg aaacccgaag 360
taatctttat ctctggacgt acagctaatac aaaagaattt agatgaattc aaaaaagctg 420
cacctaaagc gaaaatt 437

<210> 56
<211> 163
<212> DNA
<213> Staphylococcus aureus

<400> 56
gctgactatg aaggtaaagc tgacatttta aaattagatg ttgatgaaaa tccatcaact 60

gcagctaaat atgaagtgat gagtattcca acattaatcg tcttttaaaga cgggtcaacca 120
gttgataaag ttgttggttt ccaacccaaa gaaaacttag ctg 163

<210> 57
<211> 471
<212> DNA
<213> Staphylococcus aureus

<400> 57
caattggcctt tgcattattg ttgtatctat ttcgatatta ttaattgcaa tagtaatggc 60
atattatttt aaaaaaattg cacgtattaa tacagaaaaca gctattttta gtgttatacc 120
aggagcacta acacaaatgc tggatcatggc tgaacaagac aaacgtgcta atttgttagt 180
tgtagctta acgcaaacat cacgaattat atttgttggt gtttttagtac cgttcatttc 240
atattttttt catgatggta acatgcatgc gaatggaaag ttaacaaaag tcttgccttt 300
atcacaagta ttaaacatag ggcaaatagt tatttttagcg atagctatct ttatagttta 360
tctaattatg tctaaaataa agtttccaac atttcaatta ttagcaccac tcattgtatt 420
aattgtttgg aatttttcta caggtttaac atttacacta gatcattggg t 471

<210> 58
<211> 713
<212> DNA
<213> Staphylococcus aureus

<400> 58
cttagatgtc ccatgctgat ataacaattc aatcgcttta tctggatggt tttcaagatg 60
atatttatca atgattaaag ctagtgctcc cgaaacttta ggtgtggcta atgaagttcc 120
agcttgataa atatatcttc cgttattggc agtagttaaa atgttctcct tatgcatata 180
cccttcattc atccatttat ccacaccgaa ttgatttaaa taagcaaatg atcctccggg 240
cgcagcaata tctgtataat tcataccaaa attggaaaac tcagatagat tactcttttg 300
atctgtagat cctactgtaa cgacattgtc catagatgca ggaacatctt tcacttcgcc 360
attaccttga tattcacgct gtaatttttag tttctgtttg tcattgacat caataccatc 420
attaccagct gcagcaacaa cgatagattt tttcttcttg gcgtaattga ttgctttctg 480
taacgcatcg tattctactt tttcatcttt tctaaatggt tgatgggcat ttttgtccaa 540
aataatataa ctaccaacac taatattaat gacttgattt ccatcatttg cagcttgaac 600
aatcgctttt gataccctaaa gcagttctgt ttttttacta ccaaaccgc gatacattgt 660

aaatttggtta ttcggtgcaa cacctattaa cttaccatta gcactcgttt gac 713

<210> 59
 <211> 738
 <212> DNA
 <213> Staphylococcus aureus

<400> 59
 ttcaataggc gtggtgtcag tgtagcggc tacaatgttt gttgtgtcat cacatgaagc 60
 acaagcctcg gaaaaaacat caactaatgc agcggcacia aaagaaacac taaatcaacc 120
 gggagaacaa gggaatgcga taacgtcaca tcaaatgcag tcaggaaagc aattagacga 180
 tatgcataaa gagaatggta aaagtggaac agtgacagaa ggtaaagata cgcttcaatc 240
 atcgaagcat caatcaacac aaaatagtaa aacaatcaga acgcaaatg ataatcaagt 300
 aaagcaagat tctgaacgac aaggttctaa acagtcacac caaaataatg cgactaataa 360
 tactgaacgt caaaatgac aggttcaaaa taccatcat gctgaacgta atggatcaca 420
 atcgacaacg tcacaatcga atgatgttga taaatcacia ccatccattc cggcacaaaa 480
 ggtaataccc aatcatgata aagcagcacc aacttcaact acacccccgt ctaatgataa 540
 aactgcacct aaatcaacia aagcacaaga tgcaaccacg gacaaacatc caaatcaaca 600
 agatacacat caacctgcgc atcaaatcat agatgcaaag caagatgata ctgttcgcca 660
 aagtgaacag aaaccacaag ttggcgattt aagtaaacat atcgatggtc aaaattcccc 720
 agagaaaccg acagataa 738

<210> 60
 <211> 780
 <212> DNA
 <213> Staphylococcus aureus

<400> 60
 aggtcgtat gattgaaaaa attgcagagc tcgttcgtga caagaaaatt gacggtatca 60
 ctgatttacg tgatgaaaca agtttacgta ctggtgtgag tgctgttatt gatgtgcgta 120
 aggatgcaaa tgctagtgtc attttaataa acttatacaa acaaacacct cttcaaacat 180
 catttggtgt gaatatgatt gcacttgtaa atggtagacc gaagcttatt aatttaaaag 240
 aagcgttggt acattattta gagcatcaaa agacagttgt tagaagacgt acgcaatata 300
 acttacgtaa agctaaagat cgtgccata ttttagaagg gttacgtatc gcacttgacc 360
 atatcgatga aattatttca acgattcgtg agtcagatac agataaagtt gcaatggaaa 420

gcttgcaaca acgcttcaaa ctttctgaaa aacaagctca agctatttta gacatgcgtt 480
 taagacgtct aacaggttta gagagaaaca aaattgaagc tgaatataat gagttattaa 540
 attatattag tgaattagaa gccatcttag ctgatgaaga agtggtatta cagttagtta 600
 gagatgaatt gactgaaatt agagatcggt tcggtgatga gcgtcgtaca gaaattcaat 660
 taggtggatt tgaagactta gaggacgaag acttaattcc agaagaaca atagtaatta 720
 ctttgagcca taataactac attaaacggt tgccggtatc tacatatcgt gctcaaaacc 780

<210> 61
 <211> 622
 <212> DNA
 <213> Staphylococcus aureus

<400> 61
 ttggcacaac tgataagaca ggtactgtca ttcgttttaa agcagatgga gaaatcttca 60
 cagagacaac tgtatacaac tatgaaacat tacagcaacg tattagagag cttgctttct 120
 taaacaaagg aattcaaatc acattaagag atgaacgtga tgaagaaaac gttagagaag 180
 actcctatca ctatgagggc ggtattaaat cttatgttga gttattgaac gaaaataaag 240
 aacctattca tgatgagcca atttatattc atcaatctaa agatgatatt gaagtagaaa 300
 ttgcgattca atataactca ggatatgcc caaatctttt aacttacgca aataacattc 360
 atacgtacga aggtggtacg catgaagacg gatttaaacy tgcattaacy cgtgtcttaa 420
 atagttatgg tttaagtagc aagattatga aagaagaaaa agatagactt tctggtgaag 480
 atacacgtga aggtatgaca gcaattatat ctatcaaaca tggatgcct caattcgaag 540
 gtcaaacyga gacaaaatta ggtaattctg aagtgcgtca agttgtagat aaattattct 600
 cagagcactt tgaacgattt tt 622

<210> 62
 <211> 756
 <212> DNA
 <213> Staphylococcus aureus

<400> 62
 atcatcagcg acaatgagag atatggtag agagaatcat gtaagaaaag aagatttaat 60
 atatccaatt tttgtagttg aaaaagacga tgtgaaaaaa gaaattaagt cattgccagg 120
 tgtataccaa atcagtttga atttacttga aagtgaatta aaagaagctt atgacttagg 180
 catacgtgcc attatgtttt tcggtgttcc aaactcaaaa gatgatatag gtactggtgc 240

atacattcac gatggtgtta ttcaacaggc aacacgtatt gctaaaaaaaa tgtatgatga 300
 cttattaatt gttgcagaca cttgtttatg tgaatatact gatcatggtc attgtggcgt 360
 gattgatgac catacacatg acgttgacaa tgataaatca ttgccactac ttgttaaaac 420
 agcaatttct caagtggaag ctggtgctga tattattgcg ccaagtaata tgatggatgg 480
 ttttgttgct gaaattcgtc gtggattaga tgaagccggc tattacaata ttcctataat 540
 gagttatggg gtcaagtatg catcaagttt ctttggacct tttagagatg cagcagattc 600
 agcgccatca tttggggata gaaaaacgta tcagatggac cctgctaacc gtttggaaac 660
 acttcgtgaa ttagaaagtg atcttaaaga aggggtgcgc atgatgattg ttaaacctgc 720
 tctaagttat ttagatatag ttcgagatgt taaaaa 756

<210> 63
 <211> 200
 <212> DNA
 <213> Staphylococcus aureus

<400> 63
 gtgccaatg caggatatgc tacaatctca gatcaaaacg aaatcgaatt tacaggttta 60
 attatgaccc cagatggtaa agaacgattt gaatatacaa tgaacggaac agatccggtt 120
 gagttaggca aaacagtgag taacaaatta aaagagcaag gtgcttatga aattataaaa 180
 cgcttaaatg aacaacatta 200

<210> 64
 <211> 452
 <212> DNA
 <213> Staphylococcus aureus

<400> 64
 ttgataacat tgctgtgata ggaagtaaga cagcgcaata ttgtgaatca cttggcattc 60
 gagttgattt tatgccaaac gacttttctc aagaaggatt tttaaaatca tttaatcaaa 120
 ctaacaaaa aatacttttg ccttcgagtg aattggcgag accattgtta ttagcagcgt 180
 tatctaaaga taatgaagtt gttaaaatag atttatatac ttcagtgcct aacaaacaaa 240
 atatacaaga tgtaaagaa atgatagaac atcaacaaat cgatgcatta acattttcaa 300
 gttcgtcggc agtacgttat tattttaatg aaggatttgt accaaaattc aagtcgtatt 360
 ttgctatttg agaacaaca gcacggacca ttaaatcata tcaacaacca gtaacaattg 420
 cagaaattca aacactcgaa tcactaattg aa 452

<210> 65
<211> 757
<212> DNA
<213> *Staphylococcus aureus*

<400> 65
tcttccattc tctcagtcaa agaagggttta ttgatacta aaattgcttt actttcttta 60
tttatagctt tgatataatg attcactgga ttgatattcg tataacgcac accatctaca 120
taaccacttg cacctgctcc aaatccataa tattcctcat taaaccagta aaccttatta 180
tgttctgatt catggccatc taatgcaaaa ttagatatatt cgtattgatg gaaaggagat 240
tgttctatct tagacatcaa caactgatac atgtcagcac ctaaatcctc attaggaagt 300
ttaagcaacc cttttctata catattataa aattgggttt taggttcaag tattaagccg 360
taactcgaaa tatgttgaat atccatatct aaagctagat ctaaactttg ttcaaaatct 420
tcaatcgtct gtttcggtaa atgatacatt aaatctaaac tgattgattt aatacctgcg 480
tttttagcat ttaacaccga agtgtaaata tcttcagtat tgtgcgttct acctaaaaca 540
gacaataact ccggtttgaa tgtttgaacg ccattgaaa ttctatttac tccatatttc 600
tctaatagtt ggactttctc tttagttaac tcatcaggat ttgcttcaaa tgtatactcg 660
cctgtgattg taaacgtatc acgtattgct ttaagtaatc tttccaactg attaatagaa 720
agggccggtg gtgtgccgcc acctacatac atggtct 757

<210> 66
<211> 464
<212> DNA
<213> *Staphylococcus aureus*

<400> 66
agggcaaatg ctttcagtaa ctataaatag tggcattata aaatttagtg aattggatag 60
aaaagataat tcaagtaaag ataaaagtaa ttataaagta gttaggaaaa atgatattgc 120
atataattct atgagaatgt ggcaaggggc tagtggtaaa tcaaattata atgggattgt 180
tagccctgca tatactgtgc tttatccaac acaaaatact agctcattat ttattggata 240
taagtttaaa acacatagaa tgattcataa atttaaaatt aattcacaag gattaacatc 300
agatacatgg aacttaaaat ataaacaatt aaaaaatata aatatagata tacctgtatt 360
ggaggaacaa gaaaagatag gtgatttctt taaaaaatg gatataattga taagtaaaca 420
gaaaatgaaa attgaaatat tagaaaaaga gaaacaatcc tttt 464

<210> 67
 <211> 533
 <212> DNA
 <213> Staphylococcus aureus

<400> 67
 gtgccagagt tgagattccc agggtttgaa ggcgaatggg aagagaagca gttgggggat 60
 cttacagata gagtaattag gaaaaataaa aacttagaat cgaaaaagcc tttacaata 120
 tccggacagt taggtttaat tgatcaaaca gaatatTTTA gtaaatcagt ttcgtcgaaa 180
 aatctagaaa attatacact aataaagaat ggagaattcg cgtataacaa aagttattct 240
 aatggatacc cattaggggc tattaaaaga ttaactagat atgatagtgg tgtattgtcc 300
 tctttgtata tttgtttttc tattaaaagt gaaatgtcta aagacttcat ggaagcatat 360
 tttgattcga cacttggtg tagagaagtt tctggaattg cagttgaggg tgcaagaaat 420
 cacggattat taaatgtttc tgtgaatgat ttttttacta ttctaattaa atatccaagt 480
 ttagaagaac agcaaaaaat aggcaagttc ttcagcaaac tcgaccgaca aat 533

<210> 68
 <211> 721
 <212> DNA
 <213> Staphylococcus aureus

<400> 68
 tgcaccttcc attttaatag ctacattact atttttaagt ggtggacaag cacaagcagc 60
 tgagaagcaa gtgaatatgg gaaattcaca ggaggataca gttacagcac aatctattgg 120
 ggatcaacaa actagggaaa atgctaatta tcaacgtgaa aacggtgttg acgaacagca 180
 acatactgaa aatttaacta agaacttgca taatgataaa acaatatcag aagaaaatca 240
 tcgtaaaaaca gatgatttga ataaagatca actaaaggat gataaaaaag catcgcttaa 300
 taataaaaaat attcaacgtg atacaacaaa aaataacaat gctaataccta gcgatgtaaa 360
 tcaagggtta gaacaggcta ttaatgatgg taaacaaagt aaagtggcgt cacagcaaca 420
 gtcaaaagag gcagataata gtcaagattc aaacgctaata aacaatctac cttcacaag 480
 tcgaataaag gaagcaccat cattaaataa gttagatcaa acaagtcaac gagaaattgt 540
 taatgagaca gaaatagaga aagtacaacc acaacaaaat aatcaagcga atgataaaat 600
 tactaactac aattttaaca atgaacaaga agtgaaacct caaaaagacg aaaaaacact 660
 atcagtttca gatttaaaaa acaatcaaaa atcaccagta gaaccaacaa aggacaatga 720

c

721

<210> 69
 <211> 416
 <212> DNA
 <213> Staphylococcus aureus

<400> 69
 ttgacagctt tgcattttta taaatatagt gagccattta agtcacaaat tgtaacaccg 60
 aaagtcactt taacgcatcg tgattgtttg tttatcgaat tgattgatga caaaggaaat 120
 gcatattttcg gggaatgtaa cgcttttcaa acagattggg atgatcatga aacaattgcc 180
 tcagtgaaac atgtaattga gcaatgggtc gaagataata gaaataaatc atttgaaacg 240
 tatgaagcag cactaaaatt agtagattca ttggaaaata cgcctgctgc aagggaact 300
 attgtcatgg cattgtatca aatgtttcat gtactgcctt catttttcagt agcatatgga 360
 gcgacagcga gcggcttata aaataaacia ctagagtcac taaaagcaac aaagcc 416

<210> 70
 <211> 400
 <212> DNA
 <213> Staphylococcus aureus

<400> 70
 gtattattgc ttggggtgat gatgaacatc tacgtaaaat tgaagcagat gttccaattt 60
 attattatgg atttaaagat tcggatgaca tttatgctca aaatattcaa attacggata 120
 aagggtactgc ttttgatgtg tatgtggatg gtgagtttta tgatcacttc ctgtctccac 180
 aatatgggtga ccatacagtt ttaaatgcat tagctgtaat tgcgattagt tatttagaga 240
 agctagatgt taaaaatatt aaagaagcat tagaaacggt tgggtggtgtt aaacgtcggt 300
 tcaatgaaac tacaattgca aatcaagtta ttgtagatga ttatgcacac catccaagag 360
 aaattagtgct tacaattgaa acagcacgaa agaaatatcc 400

<210> 71
 <211> 613
 <212> DNA
 <213> Staphylococcus aureus

<400> 71
 tggctatcag taatgtttcg aaagggaat acgcaaagag gtttttcttt ttcgtacta 60
 gttgcttagt gttaacttta gttgtagttt caagtctaag tagctcagca aatgcatcac 120

aaacagataa cggcgtaaat agaagtgggt ctgaagatcc aacagtatat agtgcaactt 180
 caactaaaaa attacataaa gaacctgcga ctttaattaa agcgattgat ggtgatacgg 240
 ttaaattaat gtacaaaggt caaccaatga cattcagact attattgggt gatacacctg 300
 aaacaaagca tcctaaaaaa ggtgtagaga aatatgggtcc tgaagcaagt gcatttacga 360
 aaaaaatgggt agaaaaatgca aagaaaattg aagtcgagtt tgacaaaggt caaagaactg 420
 ataaatatgg acgtggctta gcgtatatatt atgctgatgg aaaaatggta aacgaagctt 480
 tagttcgtca aggcttggct aaagttgctt atgtttacaa acctaacaat acacatgaac 540
 aacatttaag aaaaagtga gacaagcga aaaaagagaa attaaatatt tggagcgaag 600
 acaacgctga ttc 613

<210> 72
 <211> 212
 <212> DNA
 <213> Staphylococcus aureus

<400> 72
 atggccaagc tgctgaagtt gattacattg gtatgccagc agtatgcttt actgaacctg 60
 aattagctac agttggttat tcagaagcgc aagctaaaga agaaggttta gcaattaaag 120
 cttctaaatt tccatatgca gcaaatggtc gtgcattatc attagacgat actaacggat 180
 ttgttaaact tattacactt aaagaagatg at 212

<210> 73
 <211> 763
 <212> DNA
 <213> Staphylococcus aureus

<400> 73
 tggaagacat cgtaaacgta gaaactacgc gagaatttca gaagtattag aattaccaaa 60
 cttaatagaa attcaaacta aatcttacga gtggttccta agagaagggt taatcgaaat 120
 gtttagagac atttctccaa ttgaagattt tactggtaat ttgtcattag agtttgtgga 180
 ttaccgttta ggagaaccaa aatatgattt agaagaatct aaaaaccgtg acgctactta 240
 tgctgcacct cttcgtgtaa aagtgcgtct aatcattaaa gaaacaggag aagttaaaga 300
 acaagaagtc tttatgggtg atttcccatt aatgactgat acaggtagct tcgttatcaa 360
 tgggtgcagaa cgtgtaatcg tatctcaatt agttcgttca ccatccgttt atttcaatga 420
 aaaaatcgac aaaaatggtc gtgaaaacta tgatgcaaca attattccaa accgtgggtgc 480

atgggttagaa tatgaaacag atgctaaaga tggtgtatac gtacgtattg atagaacacg 540
 taaactacca ttaacagtat tggtacgtgc attaggtttc tcaagcgacc aagaaattgt 600
 tgacctttta ggtgacaatg aatattttacg taatacttta gagaaagacg gcaactgaaaa 660
 cactgaacaa gcgttattag aaatctatga acgtttacgt ccaggtgaac caccaactgt 720
 tgaaaaatgct aaaagtctat tgtattcacg tttctttgat cca 763

<210> 74
 <211> 500
 <212> DNA
 <213> Staphylococcus aureus

<400> 74
 ggcagttgta ctcccacatg gtgtcttatt ccgtggtgcc gcagaaggcg tcattcgctg 60
 ttatttaatt gaagaaaaga actacttaga agccgtgatt ggcttaccag tgaatatattt 120
 ctatgggaca agtattccaa catgtatctt agtatttaaa aaatgttgcc aacaagacga 180
 caacgtatta tttatcgatg catccaatga ttttgaaaaa ggaaaaaatc aaaaccattt 240
 aagcgatgcc caagtcgaac gtattattga cacatacaag cgtaaagaaa caattgataa 300
 atacagttac agtgcgacat tacaagagat tgccgataac gattacaacc taaacatacc 360
 gaggtatgtc gatacattcg aagaagaagc gccaatgat ttagatcaag tccaacaaga 420
 tttgaaaaat atcgacaaag aaatcgaga aattgaacaa gaaatcaatg catacctgaa 480
 agaacttggg gtgttgaaag 500

<210> 75
 <211> 468
 <212> DNA
 <213> Staphylococcus aureus

<400> 75
 tgaatagaaa tactaggacc acaaccggtt atttttcaat agaagaaata gattcaagaa 60
 aaagccttga tgaaagagaa acagaaaaaa agtatcctgt gaaaatgata aacaataaaa 120
 ttattccaac tgaggagata aaagatgaaa agttgaaaaa ggaaattgaa aactttaagt 180
 tttttgtgca atatggcagt tttaaaggaa tagagaatta tgaaaatggg gacatttcct 240
 ataattctga agctcctatt tattcagcga aatataaact gaaaaatgat gattataatg 300
 ttaaagaatt acgaaaaaga tataatatcc caacagaaaa ggcgccataa ttgttggtga 360
 aagggttcggg ggatttgaaa gggcttcag ttggatataa ggaaattgaa tttatatatta 420

tagaaaataa aaaagaaaat atatattttt cagatggatt aaacttaa 468

<210> 76
<211> 512
<212> DNA
<213> Staphylococcus aureus

<400> 76
ggtgtattag ataataagg tatggtttta aatttggata gaaatacacg aacggccaag 60
ggatattatt ttgtagatac tatatatgac aatcatgaaa actcttatag taaaaattat 120
agagttgaga tgaaaaacaa taaaattatt ttattagaca aggtggaaga tcaaaaactt 180
aaagaaagaa tagaaaactt taaatttttc ggacaatatg ccgatttcaa gagtttgaaa 240
agttacaacc atggcgacgt ttcaattaat agtaatgttc caagttatga cgcgaaattt 300
aaaatgagta ataaagatga aaatgttaag caattaagaa gccgttataa cattcctact 360
gataaagctc caatattaaa aatgcatatt gatggggact taaaaggcag ttccgttgga 420
tataaaaagt tagaaataga cttttcaaaa gaagaaaata gcgaattatc aatagtcgat 480
tcattaaatt ttcaacctgc caaaaataaa ga 512

<210> 77
<211> 502
<212> DNA
<213> Staphylococcus aureus

<400> 77
aaccaaaagg cgagagttha aaatcacgag gaatgatatt aaagttagat agaaataaga 60
gaactgctaa aggaagttat attattagag aattgaaaga agataaaaat catgatgttc 120
aaaaaaatga aaagaaatat ccagtgaat tggtgaataa taggatagtt ttggtaaaag 180
atgttaaaga caaaaagtta aaaaatgaaa tagagtcggt tgaattatth tcacaatatg 240
gaaactttta tcattttgat cggaatgaga ttactaatat tcatataat cctaagtctc 300
ccaattactc tgcagaatat aaaatgaaga aaaatgacag aaacattcaa cagttgaaaa 360
agagatttaa tctaaaaact agcaagacac caaaattatt gtttaaggga tctggagata 420
taaaggggtc ttctgtagga tataaggaaa tagaaatcat atttagtaga agtaaagaag 480
aagcatttat tatgttgaca gc 502

<210> 78
<211> 400
<212> DNA

<213> Staphylococcus aureus

<400> 78

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gcgaaaagagt cgaaatcagc taatgaaatt tcacctgagc aaattaacca atggattaaa      60
gaacaccaag aaaataagaa tacagatgca caggataagt tagttaaaca ttaccaaaaa      120
ctaattgagt cattggcata taaatattct aaaggacaat cacatcacga agatttagtt      180
caagttggta tggttggttt aataggtgcc ataaatagat tcgatatgtc ctttgaacgg      240
aagtttgaag cttttttagt acctactgta atcggtgaaa tcaaaagata tctacgagat      300
aaaacttga gtgtacatgt tccgagacgt attaaagaaa ttgggccaag aatcaaaaaa      360
gtgagcgatg aactaaccgc tgaattagag cgttcacctt      400
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<210> 79

<211> 529

<212> DNA

<213> Staphylococcus aureus

<400> 79

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ccgttacggt gttcttcagt taagttaggt aaatgtaaaa ttcatagaa agcattttgt      60
tggtctttgt tgaatttggt gtcagctttt ggtgcttggt catcathtag ctttttagct      120
tctgctaaaa ggtagcgt ttggcttggg tcatctttta agctttggat gaaaccattg      180
cgttgttctt cgtttaagtt aggtaaatgt aagatttcat agaaagcatt ttgttgttct      240
ttgttgaatt tggtatccgc tttcggtgct tgagattcat ttaacttttt agcttctgac      300
aataggtttag cactttgact tgggtcatct tttaagcttt ggatgaaacc attgcgttgt      360
tcttcgttca agttaggcat gttcaagatt tcatagaaag cattttgttg ttctttgttg      420
aaattgttgt cagctttcgg tgcttgagat tcgtttaatt ttttagcttc acctaaaacg      480
ttagtgcttt ggcttgatc gtctttaaga ctttgaatga aaccattgc      529
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<210> 80

<211> 528

<212> DNA

<213> Staphylococcus aureus

<400> 80

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tgatattgga agatattagc atagatatcg aaaaaggtaa attgacttct ttaattggac      60
ctaattggtgc gggtaagagt actttacttt cagcgatttg taggttaatt cgttttgata      120
acggtgaagt gaaaatagat ggacggctca tgtctgatta taaaaataat gacttgtcga      180
aaaaaatatc tatattaaaa caaacaacc atactgaaat gaatattacg gtagagcagt      240
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tggtaaactg tggacgattc ccttattcta aaggtcgttt gacgaaagag gatcatgata 300
ttgtcaatga tgcgctagat ttgttgcaac tacaagatat cagaaatcgt aatattaagt 360
cattatctgg tggacaacgt cagcgtgcat atattgcaat gacaatagca caagatactg 420
aatatatattt gctagatgaa ccattaaata atttagatat gaagcatgct gttcaaatta 480
tgcaaacggt aaaaatgtta gcgcataaaa tgaataaagc gattgtca 528

<210> 81
<211> 513
<212> DNA
<213> Staphylococcus aureus

<400> 81
ttttgattta tcttctgacg gtttaaaata accattcttt accattctt cataacgtcc 60
cgcttcaact tcacgaggat catatttttg tttcatttcc atttgctata cctcctaaaa 120
aaataaaaat atccatccta tatacaaata ggacggatat tccgtggtac cacctatatt 180
caagaaggat gattaatatc aaattcactc ttttaacata attggaataa tcataccaat 240
actatcatcg tgaaatttga aatgcttcat ctcttcaagc actctagatt atgattaacg 300
ctcaaacacg tcttagccta ctattaatca cgttcagcta agatactctg tgggctacct 360
tcagtaagaa aatcatttac atactcacac caaatcatat gctctcttta aaataatttg 420
aacttactct tcccaaatac tatattaaac tcttaactta tagtataatg attgacaaaa 480
taagtcaatg tatagggtgg aataaaatga atg 513

<210> 82
<211> 361
<212> DNA
<213> Staphylococcus aureus

<400> 82
tggatataac aatcaaaaatc actcaatgct tgcataaccgc gttctcggtc agtagggttt 60
ttgaaactaa tttttaagc accgtatata tcttcgcgta cttctaagat tcttaagttg 120
cttatagata tgttatgtaa actcaggata taagtcactt tacttatcat acctgattca 180
tccggaatgt ctacatatag atcatacgca gtatttagtc cacctagttg tttagcgggt 240
agtgcgtcgc gatagatatt agcttgggca aaaaatgata acaatttttc agaatacttg 300
ctttcaatta gtctttctaa atcttgaaac tgacttttta gctgtcgaat catttctaaa 360
a 361

<210> 83
<211> 731
<212> DNA
<213> *Staphylococcus aureus*

<400> 83
atgagatacc taacatcagg agaatcacat ggacctcaat taacagttat tggtgaaggt 60
gtacctgcaa atttagaagt taaggttgag gatattaata aagaaatggt taagcgtcaa 120
ggcggttacg gacgtggacg tcgtatgcaa attgaaaaag atacagtgga gattgtttcg 180
gggtgaagaa atggttatac attaggtagc cctattacaa tgggtgttac taatgatgat 240
tttacacatt ggcgaaaaat tatgggccgt gcgccaataa gcgacgaaga acgagaaaat 300
atgaaacgta caattacgaa gccaaagaccg ggacatgcag atttacttgg cggtatgaaa 360
tataatcatc gtgacttacg aaatgtatta gaacgttcat ctgccagaga aacagcagca 420
cgtgtagcgg tcggtgcact atgcaaagtt ttattagaac aattagatat cgaaatatac 480
agtcgtgttg ttgagatagg tggcattaaa gataaagatt tttatgattc agaaacattt 540
aaagcaaacc ttgatcgaaa tgacgtccgt gtaattgatg atggcatcgc acaagcaatg 600
cgcgataaaa ttgatgaagc gaaaacagat ggtgattcaa tagggggcgt agttcaagtt 660
gtagttgaaa atatgcctgt tgggtgtaggt agttatgtac attatgatcg taaattagat 720
ggaagaatag c 731

<210> 84
<211> 254
<212> DNA
<213> *Staphylococcus aureus*

<400> 84
accttcaata ttgcgatcca taagtttcaa tggctcgaag acacgatcca ttggcctttt 60
accaattgaa acatcgccag acaaaacact ttcaatacct aaaccactta acaaaccagc 120
taacaatcga gtcgttgtgc cagagtttcc agtatataaa acttgatgag gtgtttttaa 180
agctttatat ccaggatgaat tcacaaccaa tttatcttca tcttctttaa tatctacgcc 240
taataatcgg aata 254

<210> 85
<211> 716
<212> DNA
<213> *Staphylococcus aureus*

<400> 85
 tcgaggaatt aacaaaggtc aaaggttata caacacatgt ggataacaat gatatgggca 60
 acttgattgt gacgaataaa tatacgccag aaacaacatc aattagtggg gaaaaagtat 120
 gggacgacaa agacaatcaa gatggtaaga gaccagaaaa agtcagtgtg aatttattgg 180
 ctaacggaga gaaagtaaaa acgttagacg tgacatctga acaaaactgg aagtacgaat 240
 ttaaagactt accgaagtat gatgaaggaa agaaaataga atatacagtg accgaagatc 300
 acgtaaaaga ctacacaaca gacatcaacg gtacgacaat aacgaacaag tatacaccag 360
 gagagacatc ggcaacagta acaaaaaatt gggatgacaa taataaccaa gacggaaaac 420
 gaccaactga aatcaaagtt gagttatatc aagatggaaa agcaacagga aaaacggcaa 480
 tattaaatga atctaataac tggacacata cgtggacagg attagatgaa aaagcaaaag 540
 gacaacaagt aaaatacaca gtcgatgaat taacaaaagt taatggctat acaacgcatg 600
 tggataacaa tgatatgggt aacttgattg tgacaaataa atatacgccg aaaaaaccga 660
 ataaaccaat ctatcctgaa aaaccaaaag acaaaacacc accaactaaa cctgat 716

<210> 86
 <211> 581
 <212> DNA
 <213> Staphylococcus aureus

<400> 86
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 tttgcaatgg ataaatcaca tccagaacca atcgaagaca atgataaaca cgatactatt 120
 aaaaatgcag aaaataacac tgagcattca acagtttctg ataagagtga agctgaacaa 180
 tctcagcaac ctaaaccata ttttacaaca ggtgctaacc aatcagaaac atcaaaaaat 240
 gaacatgata atgattctgt aaaacaagat caagatgaac ctaaagaaca tcataatggg 300
 aaaaaagcag cagctattgg tgctggaaca gcaggtgttg caggtgcagc tggtgcaatg 360
 gctgcttcta aagctaagaa acattcaa atgacgtcaaa acaaaagtaa ttctggcaag 420
 gcgaataact cgactgagga taaagcgtct caagataagt ctaaagatca tcataatggc 480
 aaaaaaggtg cagcgatcgg tgctggaaca gcaggtttgg ctggaggcgc agcaagtaaa 540
 agtgcttctg ccgcttcaaa accacatgcc tctaataatg c 581

<210> 87
 <211> 530

<212> DNA
<213> Staphylococcus aureus

<400> 87
tcgtgcatta gtaccatcag gtgcttcaac tggatgaacac gaagctgttg aattacgtga 60
tgagataaaa tcacgttatt taggtaaagg tggtactaaa gcagttgaaa acgttaatga 120
aatcatcgca ccagaaatta ttgaagggtga attttcagta ttagatcaag tatctattga 180
taaaatgatg atcgcattag acggtactcc aaacaaagggt aaattagggtg caaatgctat 240
tttaggtgta tctattgcag tagcacgtgc agcagctgac ttattagggtc aaccacttta 300
caaatatttta ggtggatttta atggtaagca gttaccagta ccaatgatga acatcgttaa 360
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tgctacaacg ttcaaagaat cattacgttg ggtactgaa atttccaca acttaaaatc 480
aattttaagc aaacgtgggt tagaaactgc agtaggtgac gaaggtgggt 530

<210> 88
<211> 560
<212> DNA
<213> Staphylococcus aureus

<400> 88
cgccaaaata gtgcttcaat atcagatagt tattattggg atatcattaa aaatctagaa 60
ttacaatttta ctgctgcatt agatttatta gaagattatc gatatggtga aaaagagtat 120
gaaaaagcaa aagatcaact aatgacaagg atattaagtg aagtcaagta tttacttgag 180
caaaaaatta aagaatatga caagtataaa gatttatata aagaatatat gagtaaaaaat 240
ccaacgtcaa aggtaaaaag agcaaatttt gatcaatata atatcgaaga cctaagagaa 300
aaagaatata atgatttact aagttctatt aaagatgcgg tagaaacatt taaatcagat 360
gtacaaaaaa tagaatatga aaataaagag ttaaaatctt attcttacga agaagaaaag 420
aaggctgctt ctagagttga tgatttagca aataaagcgt atagcgttta ttttgcgttt 480
gttagggata cacaacataa aactgaggca ttagagttaa aagcgaaagt ggatttagtt 540
ttaggtgatg aggacaaacc 560

<210> 89
<211> 462
<212> DNA
<213> Staphylococcus aureus

<400> 89

tgaaaaataa attgatagca aaatctttat taacaatagc ggcaattggt attactacaa 60
 ctacaattgc gtcaacagca gatgcgagcg aaggatacgg tccaagagaa aagaaaccag 120
 tgagtattaa tcacaatatc gtagagtaca atgatgggtac ttttaaatat caatctagac 180
 caaaatttaa ctcaacacct aaatatatta aattcaaaca tgactataat attttagaat 240
 ttaacgatgg tacattcgaa tatgggtcac gtccacaatt taataaacca gcagcgaaaa 300
 ctgatgcaac tattaaaaaa gaacaaaaat tgattcaagc tcaaaatctt gtgagagaat 360
 ttgaaaaaac acatactgtc agtgcacaca gaaaagcaca aaaggcagtc aacttagttt 420
 cgtttgaata caaagtgaag aaaatgggtct tacaagagcg aa 462

<210> 90
 <211> 584
 <212> DNA
 <213> Staphylococcus aureus

<400> 90
 aatcctcata acgcagaaag agtaaccttg aaatataaat ggaaatttgg agaaggaatt 60
 aaggcgggag attattttga ttccacatta agcgataatg ttgaaactca tggatatctca 120
 acactgcgta aagttccgga gataaaaagt acagatgggtc aagttatggc gacaggagaa 180
 ataattggag aaagaaaagt tagatatacg tttaaagaat atgtacaaga aaagaaagat 240
 ttaactgctg aattatcttt aaatctattt attgatccca caacagtgc gcaaaaaggt 300
 aacaaaaatg ttgaagttaa attgggtgag actacgggta gcaaaatatt taatattcaa 360
 tatttaggtg gagttagaga taattgggga gtaacagcta atggtcgaat tgatacttta 420
 aataaagtag atgggaaatt tagtcatttt gcgtacatga aacctaacaa ccagtcgtta 480
 agctctgtga cagtaactgg tcaagtaact aaaggaaata aaccaggggt taataatcca 540
 acagttaagg tatataaaca cattggttca gacgatttag ctga 584

<210> 91
 <211> 545
 <212> DNA
 <213> Staphylococcus aureus

<400> 91
 gctgggtgtg tactttatcct agtggcagca tatttggttg ctaaaccaca tatcgataat 60
 tatcttcacg ataaagataa agatgaaaag attgaacaat atgataaaaa tgtaaaagaa 120
 caggcgagta aagataaaaa gcagcaagct aaacctcaaa ttccgaaaga taaatcgaaa 180

gtggcaggct atattgaaat tccagatgct gatattaaag aaccagtata tccaggacca 240
gcaacacctg aacaattaaa tagagggtga agctttgcag aagaaaatga atcactagat 300
gatcaaaata tttcaattgc aggacacact ttcattgacc gtccgaacta tcaatttaca 360
aatctttaaag cagccaaaaa aggtagtatg gtgtacttta aagttggtaa tgaaacacgt 420
aagtataaaa tgacaagtat aagagatggt aagcctacag atgtaggagt tctagatgaa 480
caaaaaggta aagataaaca attaacatta attacttggt atgattacaa tgaaaagaca 540
ggcgt 545

<210> 92
<211> 527
<212> DNA
<213> Staphylococcus aureus

<400> 92
ttaacaatag aacatttaac aaagaagata ggcaacaaaa cgattctcga agatgtatca 60
tttaagctga aacgcggaca aatagttggt ctcggttgag cgaatggtgc aggtaaaaca 120
actttaatga aagttatatt aggttactct agtttccaaa gcgggaattt taatgttatt 180
aacagcaagg acgaaaaaag caatatcggc gcattgattg aaaatccagg aatatatcct 240
tttatgtctg gatatgaaaa cttgaagtta ttgaatgaat caaaaaacac tcaagatata 300
gataaaattg tctcacaact tcatatggat gaatacatc ataaaaaagc taaaacgtat 360
tctcttggtg tgaaacaaaa attaggaatt gctatagcat ttttaaataa acctcaattc 420
attatcttag atgaaccaat gaatggctta gatccaaaag ctgtgcgaga tgtacgtgaa 480
ttgattgtcc aaaaagcgca agaagtggtt actttcttaa tttcgag 527

<210> 93
<211> 645
<212> DNA
<213> Staphylococcus aureus

<400> 93
aaatggttca gtcgtaatgg cgacagggtga agtttttagaa ggtggaaaga ttagatatac 60
atttacaat gatattgaag ataagggtga tgtaacggct gaactagaaa ttaatttatt 120
tattgatcct aaaactgtac aaactaatgg aaatcaaact ataacttcaa cactaaatga 180
agaacaaaact tcaaggaat tagatgttaa atataaagat ggtattggga attattatgc 240
caattttaat ggatcgattg agacatttaa taaagcgaat aatagatttt cgcatgttgc 300

atttattaaa cctaataatg gtaaaacgac aagtgtgact gttactggaa ctttaatgaa 360
 aggtagtaat cagaatggaa atcaaccaa agttaggata tttgaatact tgggtaataa 420
 tgaagacata gcgaagagtg tatatgcaaa tacgacagat acttctaaat ttaaagaagt 480
 cacaagtaat atgagtggga atttgaattht acaaaataat ggaagctatt cattgaatat 540
 agaaaatcta gataaaactt atgttgttca ctatgatgga gagtatttaa atggtactga 600
 tgaagttgat tttagaacac aaatggtagg acatccagag caact 645

<210> 94
 <211> 548
 <212> DNA
 <213> Staphylococcus aureus

<400> 94
 ggtattgcat ctgtaacttt aggtacatta cttatatctg gtggcgtaac acctgctgca 60
 aatgctgcgc aacacgatga agctcaacaa aatgcttttt atcaagtgtt aaatatgcct 120
 aacttaaacg ctgatcaacg taatggtttt atccaaagcc ttaaagatga tccaagccaa 180
 agtgctaacg ttttaggtga agctcaaaaa cttaatgact ctcaagctcc aaaagctgat 240
 gcgcaacaaa ataagttcaa caaagatcaa caaagcgctt tctatgaaat cttgaacatg 300
 cctaacttaa acgaagagca acgcaatggt ttcatctaaa gtcttaaaga cgatccaagc 360
 caaagcacta acgttttagg tgaagctaaa aaattaaacg aatctcaagc accgaaagct 420
 gacaacaatt tcaacaaaga acaacaaaat gctttctatg aaatcttgaa catgcctaac 480
 ttgaacgaag aacaacgcaa tggtttcatc caaagcttaa aagatgaccc aagtcaaagt 540
 gctaacct 548

<210> 95
 <211> 304
 <212> DNA
 <213> Staphylococcus aureus

<400> 95
 gttatcaatt aatacaaccc ctgaagcaat tcgatacatt aaacctgcag attttcatgt 60
 tcctggcgat atttcatctg cagcgttctt tattgttgca gcacttatca caccaggaag 120
 tgatgtaaca attcataatg ttggaatcaa tccaacacgt tcaggtatta ttgatattgt 180
 tgaaaaaatg ggcggttaata tccaactttt caatcaaaca actggtgctg aacctactgc 240
 ttctattcgt attcaatata caccaatgct tcaaccaata acaatcgaag gagaattagt 300

tcca 304

<210> 96
 <211> 269
 <212> DNA
 <213> Staphylococcus aureus

<400> 96
 gtagttgaaa atatgcctgt tgggtgtaggt agttatgtac attatgatcg taaattagat 60
 ggaagaatag cacagggtgt cgtagtatt aatgcattta aagggtgaag ttttggagaa 120
 ggatttaaag cagctgaaaa gcctggtagc gaaattcaag acgaaattct ctacaatact 180
 gaattgggct attatcgtgg gtcaaatcac ttaggtggtt tagaaggcgg tatgtcaaatt 240
 ggaatgccaa ttatcgtaa tgggtgtaatt 269

<210> 97
 <211> 305
 <212> DNA
 <213> Staphylococcus aureus

<400> 97
 agacttatta tctaaacgtg gtgaactagc acaaaaaatt ggggaagaaa aattaaaaca 60
 aggtacacgt atctatgatc cacaacgtga aaaagaaatg cttaacgact taatcgatag 120
 taacaaagga ccattcaacg ataatactat taagcaatta tttaaagaaa ttttcaaagc 180
 ctctacagat ttacaaaaat ctgaaaatga aaacattta tatgtatcac gtaagttgaa 240
 acctgaagat acgattgtaa catttgataa tgggggcatt attggagacg gcaataaatc 300
 atttg 305

<210> 98
 <211> 287
 <212> DNA
 <213> Staphylococcus aureus

<400> 98
 aaaattgctg gtatcgctgc acgtgaagtt aaaggtatct tagacatgaa aggtggctta 60
 actgatacat tactaatgc attctcaagt ggaaataacg ttactcaagg tgtatctggt 120
 gaagttggtg aaaaacaagc tgctgtagac ttaaaagtaa ttttagaata tgggtgaatca 180
 gcacctaaaa tcttccgtaa agtaactgaa ttagtaaaag aacaagttaa atatattact 240
 ggtttagatg ttgttgaagt taacatgcaa gttgacgatg taatgac 287

<210> 99
<211> 429
<212> DNA
<213> Staphylococcus aureus

<400> 99
agctgagacg acacaagatc aaactactaa taaaaacggt ttagatagta ataaagttaa 60
agcaactact gaacaagcaa aagctgaggt aaaaaatcca acgcaaaaca tttctggcac 120
tcaagtatat caagaccctg ctattgtcca accaaaaaca gcaaataaca aaacaggcaa 180
tgctcaagta agtcaaaaag ttgatactgc acaagtaaat ggtgacactc gtgctaataca 240
atcagcgact acaaataata cgcagcctgt tgcaaagtca acaagcacta cagcacctaa 300
aactaacact aatgttacaa atgctgggta tagtttagtt gatgatgaag atgataattc 360
agaaaatcaa attaatccag aattaattaa atcagctgct aaacctgcag ctcttgaaac 420
gcaatataa 429

<210> 100
<211> 536
<212> DNA
<213> Staphylococcus aureus

<400> 100
cgggattctc tgcattatcc cccacggcaa caccctaat aaactcttca atgttaaaaa 60
caagacacaa atgactgata atactaagtt tattaatatt gatacgaaca caccaaagta 120
tcgagttaat aaaaagttga gcggtatcaa tggtagagat actacatata tcaacaatat 180
tgtcaccaat aacaacatag cattaaccgg atgtggatta ataattaggt cacctatata 240
agcaataata aatactaaaa agcaatgtac caaaaatgct attgataaaa tgaaaatctt 300
tgctcttatt tcttttgtaa tcgaccaatt attacttaag taataattaa atgatttatt 360
tctcatttca attttaaata acgaattaca agccatacat aatacaatcg ggatgaaagc 420
aattggccaa atattaaata gtaaagttat atatggtgac aactatttcg ctgttcccg 480
attacttttg gcgaataaga ctgtgaaaat agcaaaacaa agaaatacca gcggac 536

<210> 101
<211> 637
<212> DNA
<213> Staphylococcus aureus

<400> 101
ttaattgttc taccgctoca tttattaaat cttttaaaga gtaaaactgc taatagcaac 60

gtgataataa tatagattgc caatgttaat gtaactggta tactcccttc gataaacata 120
 taaacgtaac gtgtagcata tgtgattggt aaatagaacc acgaatgac tccaagcact 180
 tctaatacaa aataaacggt aaaaataaac attaaaactc cgacaacaat agccattaca 240
 tctttaatga aaatactaaa aataaaaagt agcagtaata taattacatt gaaaaacaat 300
 gatacgcta taaacataag tggtattttc atatcatgtg aatgccacaa taaattaatt 360
 gatgctaata gaatacatat ggctgtaata gtataagtaa aaatcattga tgcatttaac 420
 caatttagcc tattagcttt tcctaaaata tgattaaagt gaccaatatt ttcttcaaaa 480
 ttgataactt gatagacggt tatagaaatt aatagcgatg taattgcatt aaaactcgct 540
 gtaaacaaac ttatttgctg accattccat aaatttacgt ttaaatacca atttataaat 600
 aatataaaca atatgggtac aataatgggt acaaatg 637

<210> 102
 <211> 507
 <212> DNA
 <213> Staphylococcus aureus

<400> 102
 aaagataatt ggtttgctga aaaaccagtc ctctaaagaa tcgaatgtta agattcatcg 60
 cttggcgat attacaaact caaaatttga tggcaataac tatatagata gatggtgtaa 120
 aatcaggaat tctcacattg gtgaatacag ttatattgga tttggtagt attttaataa 180
 tgtagaagta ggaagatatt gttcgatata ttcggtgta aaaattgggt taggaaaaca 240
 tcctacacac ttttttagct catcaccgat tttttattct aataataatc catttaacat 300
 aaagcaaaag tttatagact ttaatgacca accaagccgt acaacaatta aaaatgatgt 360
 gtggattggt gcaaatgtaa ttattatgga tggtttaaca ataaatactg gtgcagtcac 420
 agcagccggc tcagttgtta ctaaaaatgt aggagcatat gaggttggtg gtggggttcc 480
 tgcaaaagtg attaagaagc gatttga 507

<210> 103
 <211> 639
 <212> DNA
 <213> Staphylococcus aureus

<400> 103
 caagggact taaacaaata gaaacaatta aagacgttac ggatgattat aaaattggtg 60
 gaatgaataa ttcacaagct actaataagc gattggaaaa tttagattgt aattatcggt 120

tgttaggtag caaggtagat ccaaaaaata ttctttctaa attaattaag cgtataagat 180
 ttgcaacagg tggtatccga gaaattaaag cttataaacc tgacgtgatt catgcaaag 240
 atttcgacgt attattaatg gtctatttaa gcaattataa aaaagctaatt attgtttatg 300
 atgcgcatga aatatatgcg aaaaatgcct ttattaataa agttccactt atttcaaagt 360
 ttgtagaaag tatagaaaaa cacatagtaa aacatcgtgt taatgccttc gtaacagtaa 420
 gtcatgcagc aaaagaatat tatcaatcta aaggatataa gaaggaagcg aatgttatta 480
 cgaatgcacc tatttttaaat gatagcagag aatttaaaga aatcgaaaac tttaaagaaa 540
 ttgtatatca aggtcaaatt gtaatggaca gaggatatga agagtttatt attgcttcat 600
 cagcttttaa acaaaatgct ccttcattca taattcgag 639

<210> 104
 <211> 380
 <212> DNA
 <213> Staphylococcus aureus

<400> 104
 actttgtgca attatcagca tgaacatatt tatagtaatc tctacattta ctaaagaagt 60
 attagggttc cctatagagc cgggtgtatta ctcaaccatg gttggtatag cattaattac 120
 cacggtgttt gctatttata agataattgt cacgcaagaa attccgagag ggttaatat 180
 attaatgtct atatgtttgc tttatctagc tttttattat ttttcaccag ataaggaaga 240
 gaaactagct aaaaataata ttctattctt tttaacatgg gcagttccag cggcaattag 300
 tgggtatttat attaaatata taaacaaggc tacggtagaa agatttttta aattagtatt 360
 tttcatattt tctgtttcat 380

<210> 105
 <211> 500
 <212> DNA
 <213> Staphylococcus aureus

<400> 105
 ttatggatag cgtaaagaca ataattggta cgttgcttat agcttttagga ttacaatttt 60
 tagcttatcc aattattaat caacgagtag gtaatgaagc gtttggttct attttaacga 120
 tttatacaat aataacaatc acgagtgttg tattaggcaa tacgcttaac aatatacgat 180
 tgattaatat gaatctatac aaatccaatc attactactg gaaatttgtg tcgatacttt 240
 taatttcaat tctgattgag agtatagctt taattattgt atttctttac ttttttaatt 300

tgaacacccat cgatattatc tttttaattc tacttaatat tttaatgtgt ttaaggattt	360
atctgaatgt attttttagg atgactttaa aatataatca gattttgtat attgctctta	420
ttcaattttt aggtttgctg ataggactat ttctatatta tttaatccaa aactggattg	480
tttgttttat taccagtga	500

<210> 106
 <211> 522
 <212> DNA
 <213> Staphylococcus aureus

<400> 106	
gattcttggc gctactaaca ttaagcatat gtcattatta tcacattatt taaaccacat	60
tgatttgaat atcaatgagg tggacattat atacactgac aaatatgata tcgaagaaca	120
tatccaaggc atcaataatt actataaata taaagtagat attaaagaag attggacatt	180
tatcaaaaaa gctattgctt actatcgatt taggccatac gctatgaaaa ttcttaaaaga	240
aaatcgttat gattttgtca tagtatgggg aagttataca ggacacttat ttaaaagttt	300
tttagaaaaa cactataaaa ataaattcat tttaaataata agggactact tttttgaaaa	360
taataaactt attaaagtata gaatgaaaaa aatcgttgat gctagcaggg tgacaacatt	420
atcttcagaa ggttttctta aatttttacc taaatctgaa aaatatagaa ttatttatag	480
ttataacatg agtattatta gagaaagtaa tgtaaccgat gg	522

<210> 107
 <211> 655
 <212> DNA
 <213> Staphylococcus aureus

<400> 107	
taatgtttcc ttgccttatg ttaggtgata aacctttatt attttttagca cctataagtt	60
atggagtagg aaagctcttt ataagcttct cgaataatcc gaattttaaa ttttcgaaaa	120
ttgtatacga tgtttttaggt tttcttagat tagtatattat acctgctatg atagtgtttt	180
tccaggattc aactatagat aatttaccat taggacaagc ttattttaat caagcgggta	240
tttatatgag tgtggagttt atcataggct cgctatattat attgatacta tctaaattat	300
tcaaacatga agtggatca agaaatagct ttacactttc tggatcatca atttattaca	360
ttgtgtttgg tcttgttatt tgtgggattt ttgtagcttt tcccgaagtg cgcaaaaaca	420
tatcattttt aattattaaa acagatgcaa tgggaagagg aaccgaagca acaagtgggt	480

taaatgttct ttttgtaatg ctatttcaac ttgccttagc gttattattc ttaataatcg 540
 catatgcttc atataaaaag tataaagaga atcctaaaat tatttatgtt gtattaccgc 600
 tagctatagg aattttaaat attagtttaa ttgttggtga aagaagaagt tatca 655

<210> 108
 <211> 459
 <212> DNA
 <213> Staphylococcus aureus

<400> 108
 gtaaaaacat ttatgaaatc gaaaatattt agattaatga atacaccact attattattt 60
 tataagaaag aatattttaac tggatattat tttgaaaata aagtggctgg atggttatgg 120
 gcgtggaaag ctgttccgtt caagttgtta ggaataaata caagtttgcc atttcctgca 180
 gatataactg ttagaatgca taaccctaata aacattgttt ttgataaaaa tgatattcat 240
 atttttcaat cgcccgggac gtatttttaata aatttttcag cagttatata tataggtaga 300
 ggtgtttata tagcgcctaa cgtaggtatt attacagcta atcataatat taaaaatttg 360
 aagtcacatg caccagggtga agatgtcaaa atagggaatt atagttggat tggaatgaac 420
 tcagttatat taccaggagt agaattgggg gaacataca 459

<210> 109
 <211> 562
 <212> DNA
 <213> Staphylococcus aureus

<400> 109
 aagatacgat ttgttgattg tgaataccaa aaatgaccgt agtgctaata tactttcaca 60
 aatcagtttt ttgatatcat tgcttatttt attaatactg ataccaatat ttgcgattag 120
 tgcattgttta tacccaaact ttatattaga ttttattttc attattatta tgttgttttt 180
 ggtaagttta acaaacattt ttacaaatta tctaaataag gaaagaaagt ataaagtgtt 240
 aagtttgatt aatgtgttta gagctggatc aatggcttta cttcaaatca ttttcggact 300
 tttagcatta ggaagtttag gattaattat tggtttttca ttatcctata tcgcaggcat 360
 tacactagga tataaaacgt ttaaaaagca ctttaatat gtgagagata aagaagaaac 420
 taaagcatta tttttagaaa ataaaaatca gttagtttat tcaacaccat caatattatt 480
 aaatagtttg tctttctcgg ttgttggtgtt ctttataggt attttgtata ccaatacaga 540
 agtgggtatt tatggtatgg cc 562

<210> 110
<211> 104
<212> DNA
<213> Staphylococcus aureus

<400> 110
ttttatctta attaaggaag gagtgatttc aatggcacia gatattcattt caacaatcag 60
tgacttagta aaatggatta tcgacacagt gaacaaattc acta 104

<210> 111
<211> 351
<212> DNA
<213> Staphylococcus aureus

<400> 111
aaatatcaaa tcgctgtggc tgatacgaat gttcaaacgc cagattatga aaagttgagg 60
aacacatggc tggacgttaa ctatgggtat gataagtatg atgagaagaa tgacgcaatg 120
aagaagaagt ttgaggctac ggagaatgag gcaaagaaat tacttagtga gatgaaaact 180
gaaagtgata ggaaatactt gtgggaaaac tcaaaagatt tagatacgaa gtctgcggat 240
atgactcgta cctatcgtaa tattgagaaa atcgcagaag cgatgaagca taaagatact 300
aagttaaaaa tagatgaaaa caagaagaaa gtgaaagatg cccttgagtg g 351

<210> 112
<211> 278
<212> DNA
<213> Staphylococcus aureus

<400> 112
gggttcttgc tgtctttaag tgattcagag aatacttctt gtgcacgttc tgggtgttcg 60
cgtaatgttt tgatgtattg gttacgttgt tcttctgtga taccttttag atgtaatact 120
tgataaaaaag ctttttgttg atctgttacg tagttgtttt gagttgtttg gtgcttagtt 180
gaagtttggt gcgtgttttc actcgctttt gcttcccat ttgaaatcat tntagctaaa 240
gtaattgttg ctgcccacac tagcaacttc gagatata 278

<210> 113
<211> 226
<212> DNA
<213> Staphylococcus aureus

<400> 113
aaagatagtt ctaagataaa tgggtccatta agactcgcag gtggagatat taataagcta 60

gattcaacaa ctcaagacaa agtaagaaga ttagattcat ctattttctaa atctactact 120
cctgaatctg tatacgttta tagactttta aatttagatt atttgacaag tatcgttgga 180
tttacaatg aagatttata taaattacaa cagaccaata atggcc 226

<210> 114
<211> 576
<212> DNA
<213> Staphylococcus aureus

<400> 114
gctagtgcac ttgttattca agacgaactg atgcaaaaa accatgcaaa agcagaagtt 60
tcagcagaag aaataaaaaa acatgaagag aaatggaata agtactatgg tgtcaatgca 120
tttaatttac caaaagagct ttttagtaaa gttgatgaaa aagatagaca aaagtatcca 180
tataatacta taggtaatgt ttttgtaaaa ggacaaacaa gtgcaactgg tgtgttaatt 240
ggaaaaaata cagttctaac aaatagacat atcgctaaat ttgctaattg agatccatct 300
aaagtatctt ttagaccttc tataaataca gatgataacg gtaatactga aacaccatat 360
ggagagtatg aagtcaaaga aatattacaa gaaccatttg gtgcagggtg tgatttagca 420
ttaatcagat taaaaccaga tcaaaacggg gtttcattag gcgataaaat atcgccagca 480
aaaataggga catctaata tttaaaagat ggagacaaac tcgaattaat aggctatcca 540
ttcgatcata aagttaacca aatgcacaga agtgaa 576

<210> 115
<211> 630
<212> DNA
<213> Staphylococcus aureus

<400> 115
ttttagcagc gtcaattttt actatttcct tacctgtgat tccttttgaa agtacattac 60
aagcaaaaga atacagcgca gaagaaatca gaaaattaaa acaaaaattt gaggttccac 120
ctacagataa agagctttat acacacatta cggataatgc aagaagtcct tataattctg 180
ttggtacagt gtttgtcaaa ggtagtacat tagctaccgg agttttaatt ggtaaaaaata 240
caattgttac taattaccac gttgcaagag aagcagccaa aaacccatcg aatattatct 300
ttacacccgc tcaaaataga gatgcagaaa aaaatgaatt ccctactccg tatggaaaat 360
ttgaagctga agaaattaaa gaatctccgt atggacaagg actcgattta gctataataa 420
aattaaaacc aaacgaaaaa ggggaatcag cgggagattt aattcaacca gctaataata 480

ctgatcatat tgatatacaa aaaggagaca aatattcttt attaggatat ccttataatt 540
 attcagctta ctctttatat caaagtcaga ttgaaatggt caatgattct caatattttg 600
 gatatactga ggtaggaaac tctggatcag 630

<210> 116
 <211> 330
 <212> DNA
 <213> Staphylococcus aureus

<400> 116
 agaaagaaag tgatttctat gattaaaaat aaaatattaa cagcaacttt agcagttggt 60
 ttaatagccc ctttagccaa tccatttata gaaatttcta aagcagaaaa taagatagaa 120
 gatatcggcc aagggtgcaga aatcatcaaa agaacacaag acattactag caaacgatta 180
 gctataactc aaaacattca atttgatttt gtaaaagata aaaaatataa caaagatgcc 240
 ctagttgtta agatgcaagg cttcattagc tctagaacaa catattcaga cttaaaaaaa 300
 tatccatata ttaaaagaat gatatggcca 330

<210> 117
 <211> 350
 <212> DNA
 <213> Staphylococcus aureus

<400> 117
 tcgttacacc gaatgggcaa gtatctgcat atgatcaata cttatttgca caagacccaa 60
 ctgggtccagc agcaagagac tatttcgtcc cagataatca actacctcct ttaattcaaa 120
 gtggctttta tccatcatatt attacaacat tgtcacacga aaaaggtaaa ggtgataaaa 180
 gcgagtttga aatcacttac ggcagaaaca tggatgctac atatgcatac gtgacaagac 240
 ctcgttttagc cgttgataga aaacatgatg cttttaaaaa ccgaaacggt acagttaaatt 300
 atgaagtga ctggaaaaca catgaagtaa aaattaaaag catcacacct 350

<210> 118
 <211> 221
 <212> DNA
 <213> Staphylococcus aureus

<400> 118
 ttttaagcgt ctatcacaca gacaagatgg cgctaaaaaa tctaaaatta cagtaactta 60
 tcaacgtgaa atggatttat accaaattcg ttggaatggc ttctactggg caggcgcgaa 120
 ttataaaaaac tttaaaacta gaacatttaa atcaacatat gaaattgatt gggaaaatca 180

caaagtgaaa ttgttagata caaaagaaac tgaaaacaat a 221

<210> 119
 <211> 337
 <212> DNA
 <213> Staphylococcus aureus

<400> 119
 ttgatagcga tttatttgta ggctacaaac ctcatagtaa agatcctaga gattatttcg 60
 ttccagacag cgagttacca cctcttgtag aaagtggatt taacccttca tttatcgcaa 120
 cagtatctca cgaaaaaggt tcaagcgaca cgagcgaatt tgaaatcact tatggaagaa 180
 atatggatgt cactcatgcc attaaaagat caacacatta tggcaacagt tatttagatg 240
 gtcatagagt ccataatgca tttaaaaata gaaactacac tgtgaaatat gaagtcaatt 300
 ggaagactca cgaaatcaaa gtgaaaggac agaattg 337

<210> 120
 <211> 752
 <212> DNA
 <213> Staphylococcus aureus

<400> 120
 gtcagctcag taacaacaac actattgcta ggttccatat tgatgaatcc tgtcgctggt 60
 gccgcagatt ctgatattaa tattaaaacc ggtactacag atattggaag caatactaca 120
 gtaaaaacag gtgatttagt cacttatgat aaagaaaatg gcatgcacaa aaaagtattt 180
 tatagtttta tcgatgataa aaatcacaaat aaaaaactgc tagttattag aacgaaaggt 240
 accattgctg gtcaatatag agtttatagc gaagaagggtg ctaacaaaag tggtttagcc 300
 tggccttcag cttttaagggt acagttgcaa ctacctgata atgaagtagc tcaaatatct 360
 gattactatc caagaaatc gattgatata aaagagtata tgagtacttt aacttatgga 420
 ttcaacggta atgttactgg tgatgatata ggaaaaattg gcggccttat tggtgcaaat 480
 gtttcgattg gtcatacact gaaatatgtt caacctgatt tcaaaacaat tttagagagc 540
 ccaactgata aaaaagtagg ctggaaagggt atatttaaca atatggtgaa tcaaaattgg 600
 ggaccatatg atagagattc ttggaacccg gtatatggca atcaactttt catgaaaact 660
 agaaatgggt ctatgaaagc agcagataac ttccttgatc ctaacaaagc aagttctcta 720
 ttatcttcag ggttttcacc agacttcgct ac 752

<210> 121
 <211> 507
 <212> DNA
 <213> Staphylococcus aureus

<400> 121
 tgttatcgac cgttttgtat ccaaattggg ggcaatataa acgcgctgat ttaatcggac 60
 aatcttctta tattaaaaat aatgatgtcg taatattcaa tgaagcattt gataatgggtg 120
 cttcagacaa attattaagt aatgtgaaaa aagaatatcc ttaccaaaca cctgtactcg 180
 gtcgttctca atcaggtttg gacaaaactg aaggtagcta ctcatcaact gttgctgaag 240
 atggtggcgt agcgattgta agtaaatatc ctattaaaga gaaaatccag catgttttca 300
 aaagcggttg tggattcgat aatgatagca acaaaggctt tgtttatata aaaatagaga 360
 aaaatggtaa gaacgttcac gttatcggta cacatacaca atctgaagat tcacgttgtg 420
 gtgctggaca tgatcgaaaa attagagctg aacaaatgaa agaaatcagt gactttgtta 480
 aaaagaaaaa tatcccaaaa gatgaaa 507

<210> 122
 <211> 213
 <212> DNA
 <213> Staphylococcus aureus

<400> 122
 ggtgtcctat ctcgaaaaca aaacgctgca aaaaaatcaa aaattactgt tacttatcaa 60
 agtgaaatgg atagatatac aaacttttgg atcaacttca actggatagg taataattat 120
 aaagatcaca taagagcaac tcatacatca atttatgaag ttgattggga aaatcataca 180
 gttaaattaa tagatactca atctaaggaa aaa 213

<210> 123
 <211> 220
 <212> DNA
 <213> Staphylococcus aureus

<400> 123
 ataaagaaag gaaatgattt tatgggtcaaa aaaagactat tagctgcaac attgtcggtta 60
 ggaataatca ctctatttgc tacttcgttt catgaatcta aagctgataa caatattgag 120
 aatattggtg attgcgctga ggtagtcaaa agaacagaag atacaagttg cgataagtgg 180
 ggggtcacac aaaatattca gtttgatttt gttaaagata 220

<210> 124

<211> 359
<212> DNA
<213> Staphylococcus aureus

<400> 124
atcattaggt aaaatgtctg gacatgatcc aaatttattt gttggatata aaccatatag 60
tcaaaaatccg agagactatt ttgtgccaga caatgaatta cccccattag tacacagtgg 120
tttcaatcct tcattttattg caactgtttc tcatgaaaaa ggctcaggag atacaagtga 180
atttgaaata acgtatggca gaaatatgga tgttactcat gctactagaa gaacaacaca 240
ctatggcaat agttatttag aaggatctag aatacacaag gcatttgtaa acagaaatta 300
cacagttaaa tatgaagtga actggaaaac tcatgaaatt aaagtgaag gacataatt 359

<210> 125
<211> 612
<212> DNA
<213> Staphylococcus aureus

<400> 125
aagttgctca aatacaagct ggtttacaat ataaaccaca agtacaacgt gtaccaggta 60
agtggaacaga tgctaacttt aatgatgtta agcatgcaat ggatacgaag cgttttagctc 120
aagatccagc attaaaatat caattcttac gcttagacca accacaaaat atttctattg 180
ataaaaattaa tcaattctta aaaggtaaag gtgtattaga aaaccaaggt gctgcattta 240
acaaagctgc tcaaatgtat ggcattaatg aagtttatct tatctcacat gccctattag 300
aaacaggtaa cggacttct caattagcga aagggtgcaga ttagtgtaac aacaaagttg 360
taactaactc aaacacgaaa taccataacg tatttgggtat tgctgcatat gataacgatc 420
ctttacgtga aggtattaaa tatgctaaac aagctgggtg ggacacagta tcaaaagcaa 480
tcgttgggtg tgctaaattc atcggaact catatgtaaa agctgggtcaa aatacacttt 540
acaaaatgag atggaatcct gcacatccag gaacacacca atatgctaca gatgtagatt 600
gggctaacat ca 612

<210> 126
<211> 401
<212> DNA
<213> Staphylococcus aureus

<400> 126
tgttattatt ctcatcttct tcaattacta atgaggtaag tgcatacagt tcattcgaca 60
aaggaaaata taaaaagggc gatgacgcga gttattttga accaacaggc ccgtatttga 120

tggtaaatgt gactggagtt gatggtaaag gaaatgaatt gctatcccct cattatgtcg	180
agtttcctat taaacctggg actacactta caaaagaaaa aattgaatac tatgtcgaat	240
gggcattaga tgcgacagca tataaagagt ttagagtagt tgaattagat ccaagcgcaa	300
agatcgaagt cacttattat gataagaata agaaaaaaga agaaacgaag tctttcccta	360
taacagaaaa aggttttggt gtcccagatt tatcagagca t	401

<210> 127
 <211> 715
 <212> DNA
 <213> Staphylococcus aureus

<400> 127	
ttttattcat tgcctaacg ttgacaacaa gtccacttgt aaatggtagc gagaaaagcg	60
aagaaataaa tgaaaaagat ttgcgaaaaa agtctgaatt gcagggaaaca gctttaggca	120
atcttaaaaa aatctattat tacaatgaaa aagctaaaac tgaaaaataa gagagtcacg	180
atcaatTTTT acagcatact atattgttta aaggctTTTT tacagatcat tcgtggtata	240
acgatttatt agtagatttt gattcaaagg atattgttga taaatataaa gggaaaaaag	300
tagacttgta tgggtgcttat tatggttatc aatgtgcggg tggtagacca aacaaaacag	360
cttgtagtga tgggtggtga acgttacatg ataataatcg attgaccgaa gagaaaaaag	420
tgccgatcaa tttatggcta gacggtaaac aaaatacagt acctttggaa acggttaaaa	480
cgaataagaa aaatgtaact gttcaggagt tggatcttca agcaagacgt tatttacagg	540
aaaaatataa tttatataac tctgatgttt ttgatgggaa gggttcagagg ggattaatcg	600
tgtttcatac ttctacagaa ctttcggtta attacgattt atttggtgct caaggacagt	660
attcaaatac actattaaga atatatagag ataataaaac gattaactct gaaaa	715

<210> 128
 <211> 233
 <212> DNA
 <213> Staphylococcus aureus

<400> 128	
cgtagatgtg tttggagcta attattatta tcaatgttat ttttctaaaa aaacgaatga	60
tattaattcg catcaaactg acaaacgaaa aacttgtagt tatggtggtg taactgagca	120
taatggaaac caattagata aatatagaag tattactgtt cgggtatttg aagatggtaa	180
aaatttatta tcttttgacg tacaaaactaa taagaaaaag gtgactgctc aag	233

<210> 129
<211> 360
<212> DNA
<213> *Staphylococcus aureus*

<400> 129
aatttttggc acatgattta atttataaca ttagtgataa aaaactgaaa aattatgaca 60
aagtgaaaac agagttatta aatgaagggt tagcaaagaa gtacaaagat gaagtagttg 120
atgtgtatgg atcaaattac tatgtaaaact gctatttttc atccaaagat aatgtaggta 180
aagttacagg tggcaaaact tgtatgtatg gaggaataac aaaacatgaa ggaaaccact 240
ttgataatgg gaacttacia aatgtactta taagagttaa tgaaaaataa agaaacacia 300
tttcttttga agtgcaaaact gataagaaaa gtgtaacagc tcaagaacta gacataaaag 360

<210> 130
<211> 501
<212> DNA
<213> *Staphylococcus aureus*

<400> 130
ccacctgttg aaggaagagg agttattaat tctagacagt ttttatctca tgatttaatt 60
tttccaattg agtataagag ttataatgag gttaaaactg aattagaaaa tacagaatta 120
gctaacaatt ataaagataa aaaagtagac atttttggcg ttccatattt ttatacatgt 180
ataataccta aatctgaacc ggatataaac caaaattttg gaggttggtg tatgtatggt 240
ggctctacat ttaatagttc agaaaaatgaa agagataaat taattactgt acaggtaaca 300
atcgacaata gacaatcact tggatttaca ataactacia ataagaatat gggtactatt 360
caggaactag attacaaagc aagacactgg ctactaaag aaaaaaagct atacgagttt 420
gatggttctg catttgaatc tggatatata aaattttactg aaaagaacia tacaagtttt 480
tggtttgact tatttcctaa a 501

<210> 131
<211> 542
<212> DNA
<213> *Staphylococcus aureus*

<400> 131
gaagatttac acgataaaag tgagttaaca gatttagctt tagctaagtc atatggtcaa 60
tataatcacc cattcattaa agaaaatatt aagagtgatg aaataagtgg agaaaaagat 120

ttaatatatta gaaatcaagg tgatagtggc aatgatttga gagtaaagtt tgcaactgct	180
gatttagctc agaagtttaa aaataaaaat gtagatatat atggggcatc tttttattat	240
aagtgtgaaa aaataagtga aaatatattct gaatgtctat atggaggtac aacactaaat	300
agtgaaaaat tggcacagga aagggtgatt ggtgctaata tttgggtaga tggatttcaa	360
aaagaaacag aattaatacg aacaaataag aaaaatgtga cattgcaaga attagatata	420
aagatcagaa aaatatgtgc cgataaatat aaaatttatt ataaagacag cgaaataagt	480
aaaggtctaa ttgaatttga tatgaaaact cctagagatt actcattcga catttatgat	540
tt	542

<210> 132
 <211> 343
 <212> DNA
 <213> Staphylococcus aureus

<400> 132	
agtcttatct aacggcgatg taggtccagg aaatctaaga aattttttata ctaaatatga	60
atatgtgaat ttaaagaatg ttaaagacaa aaattcacca gaatcacacc gcttagaata	120
ctcgtataaa aatgatacat tgtatgctga atttgacaat gaatatataa ctagtgatct	180
aaagggaaaa aatgtcgatg tttttggtat aagctataaa tatggttcta actctcgtag	240
tatatatggt ggtgttacta aagcagaaaa caataaatta gattcgccaa gaataatacc	300
tataaattta attatcaatg gcaagcatca aacagttaca act	343

<210> 133
 <211> 272
 <212> DNA
 <213> Staphylococcus aureus

<400> 133	
ggatataaat acggaaataa agttacattt atagataatt ctcaacaaat tgatgttaca	60
ttgacaggaa atgaaaaatt aactgttaaa gatgatgacg aagttttctaa tgttgacgtg	120
tttgtagtaa gagaaggtag tgacaaatca gctatcacia catcgattgg tggaattaca	180
aagacaaatg ggactcaaca taaagatact gttcaaaacg ttaatttgct agtttctaag	240
agtacaggtc aacacactac ttctgtgact tc	272

<210> 134
 <211> 450
 <212> DNA

<213> *Staphylococcus aureus*

<400> 134

atgaaattta aagcgatagc aaaagcaagt ttagcattgg gaatgtagc aacagggtga	60
attacatcga atgtacaatc agtacaagcg aaaacagaag ttaaacaaca aagtgaatca	120
gagttgaaac actattataa taaaccgggt ttagagcgta aaaatgttac tggatataaa	180
tatactgaaa aaggtaaaga ttatatagat gttatagtag acaatcaata ttctcaaatt	240
tcttttagttg gatctgataa agacaaatth aaagatggag acaactcgaa tatagatgtg	300
tttatcctta gagaagggtga cagtagacaa gcaacaaatt actcaattgg tggcgtaaca	360
aaaacaaaca gtcaaccttt tattgactat atacacacac caatccttga aatcaagaaa	420
ggtaaagaag aaccacaaag tagtttatac	450

<210> 135

<211> 500

<212> DNA

<213> *Staphylococcus aureus*

<400> 135

gtattgaata taaaaatgtg acaggttata tcagtttcat tcaaccaagt attaaattta	60
tgaatatcat agatggtaat tctgttaata accttgcttt aattggcaaa gataagcaac	120
attatcatatc ggggtgtacat cgtaatctta atatatttta cgttaatgag gataagagat	180
ttgaagggtgc aaagtactct attgggggta tcactagtgc aaacgataaa gctgtcgacc	240
taatagcaga agcaagagtt attaaagcag atcatattgg tgaatatgat tatgactttt	300
tcccatttaa aatagttaaa gaagcgatgt cattgaaaga gattgattht aaattaagaa	360
aataccttat tgataattat ggtctttacg gtgaaatgag tacagggaaa attaccgtca	420
aaaagaaata ctatggaaag tatacattht aattggataa aaagttacaa gaagaccgta	480
tgtccgatgt tatcaatgtc	500

<210> 136

<211> 384

<212> DNA

<213> *Staphylococcus aureus*

<400> 136

gcgcaattac agtaacgacg caatcgggtca aagcagaaaa aatacaatca actaaagttg	60
acaaagtacc aacgcttaaa gcagagcgat tagcaatgat aacataaca gcagggtgcaa	120
attcagcgac aacacaagca gctaacacaa gacaagaacg cagcctaaa ctcgaaaagg	180

caccaaatac taatgaggaa aaaacctcag cttccaaaat agaaaaata tcacaaccta 240
aacaagaaga gcagaaatcg cttaatatat cagcaacgcc agcgcctaaa caagaacaat 300
cacaaacgac aaccgaatcc acaacgccga aaactaaagt gacaacacct ccatcaacaa 360
acacgccaca accaatgcaa tcta 384

<210> 137
<211> 270
<212> DNA
<213> Staphylococcus aureus

<400> 137
tttaaaagtt agttctttat tcgttgcaac ttgacaaca gcgacacttg tgagttctcc 60
agcagcaaac gcgttatctt caaaggctat ggacaatcat ccacaacaaa cgcagtcaag 120
caaacagcaa acacctaaga ttcaaaaagg cggtaacctt aaaccattag aacaacgtga 180
acacgcaaat gttatattac caaataacga tcgtcaccaa atcacagata caacgaatgg 240
tcattatgca cccgtaactt atattcaagt 270

<210> 138
<211> 556
<212> DNA
<213> Staphylococcus aureus

<400> 138
tttttatcgt aagccctttg ttgcttgcca caatcgctac agattttacc cctgttccct 60
tatcatctaa tcaaataatc aaaactgcaa aagcatctac aaacgataat ataaaggatt 120
tgctagactg gtatagtagt gggcttgaca cttttacaaa tagtgaagtt ttagataatt 180
ccttaggatac tatgcgtata aaaaacacag atggcagcat cagccttata atttttccga 240
gtccttatta tagccctgct tttaaaaag gggaaaaagt tgacttaaac aaaaaagaa 300
ctaaaaaag ccaacatact agcgaaggaa cttatatcca tttccaaata agtggcggtta 360
caaatactga aaaattacct actccaatag aactaccttt aaaagttaag gttcatggta 420
aagatagccc cttaaagtat tggccaaagt tcgataaaaa acaattagct atatcaactt 480
tagactttga aattcgcat cagctaactc aaatacatgg attatatcgt tcaagcgata 540
aaacgggtgg ttattg 556

<210> 139
<211> 532

<212> DNA

<213> Staphylococcus aureus

<400> 139

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gtgggtcatga agctaaagcg gcagaacata cgaatggaga attaaatcaa tcaaaaaatg      120
aaacgacagc cccaagttag aataaaacaa ctaaaaaagt tgatagtcgt caactaaaag      180
acaatacgca aactgcaact gcagatcagc ctaaagttag aatgagttag agtgcaacag      240
ttaaagaaac tagtagtaac atgcaatcac cacaaaacgc tacagctaat caatctacta      300
caaaaactag caatgtaaca acaaatgata aatcatcaac tacatatagt aatgaaactg      360
ataaaagtaa tttaacacaa gcaaaagatg tttcaactac acctaaaaca acgactatta      420
aaccaagaac tttaaatcgc atggcagtga atactgttgc agctccacaa caaggaacaa      480
atgttaatga taaagtacat ttttcaaata ttgacattgc gattgataaa gg              532
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<210> 140

<211> 622

<212> DNA

<213> Staphylococcus aureus

<400> 140

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cgggcaaata aataaagatg taacagatat aaaaatatat caagttccta aagggttatac      60
attaaataaa ggatacgatg tgaataactaa agagcttaca gatgtaacaa atcaataactt      120
gcagaaaatt acatatggcg acaacaatag cgctgttatt gatttttgaa atgcagattc      180
tgcttatggt gtaatggtta atacaaaatt ccaatatata aatagcgaaa gcccaacact      240
tgttcaaatg gctactttat cttcaacagg taataaatcc gtttctactg gcaatgcttt      300
aggatttact aataaccaa gtggcggagc tgggtcaagaa gtatataaaa ttggtaacta      360
cgtatgggaa gatactaata aaaacggtgt tcaagaatta ggagaaaaag gcgttggcaa      420
tgtaactgta actgtatttg ataataatac aaatacaaaa gtaggagaag cagttactaa      480
agaagatggg tcatacttga ttccaaactt acctaattga gattaccgtg tagaattttc      540
aaacttacca aaaggttatg aagtaacccc ttcaaaacaa ggtaataacg aagaattaga      600
ttcaaacggc ttatcttcag tt              622
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<210> 141

<211> 892

<212> DNA

<213> Staphylococcus aureus

<400> 141
aaagttggcg atggtaaaga taatgtggca gcagcgcgcatg acggtaaaga tattgaatat 60
gatacagagt ttacaattga caataaagtc aaaaaaggcg atacaatgac gattaattat 120
gataagaatg taattccttc ggatttaaca gataaaaatg atcctatcga tattactgat 180
ccatcaggag aggtcattgc taaaggaaca tttgataaag caactaagca aatcacatat 240
acatttacag actatgtaga taaatatgaa gatataaaat cacgcttaac tctatattcg 300
tatattgata aaaaaacagt tccaaatgag acaagtttga atttaacatt tgctacagca 360
ggtaaagaaa caagccaaaa tgtcactggt gattatcaag atccaatggt ccatgggtgat 420
tcaaacattc aatctatctt taaaaatta gatgaagata agcaaactat tgaacaacaa 480
atztatgtta acccattgaa aaaatcagca accaacta aagttgatat agctggtagt 540
caagtagatg attatggaaa tattaaacta ggaaatggta gcaccattat tgacccaaat 600
acagaaataa aggtttataa agttaactct gatcaacaat tgcctcaaag taatagaatc 660
tatgatttta gtcaatacga agatgtaaca agtcaatttg ataataaaaa atcatttagt 720
aataatgtag caacattgga ttttggtgat attaatcag cctatattat caaagttggt 780
agtaaataa cacctacatc agatggcgaa ctagatattg cccaaggtag tagtatgaga 840
acaactgata aatatgggta ttataattat gcaggatatt caaacttcat cg 892

<210> 142
<211> 747
<212> DNA
<213> Escherichia coli

<400> 142
gtttgggact tattgctctg gcggtgggta atgcatatgc aacacaattg ttggatgatt 60
atagtataat ttctatatg actgatgaag aatcgccgat tgaaatcaaa gataataatc 120
cgataagtaa tggagagtat ctaaccactg aagacgaaag ccatgctgtg aaagtggatg 180
acggtgtaac tggatatata aataatgcca gtgtgatgac tagtgggtgat ggatcttatg 240
gtatttctgt tgatagtcaa aacaaagtat tatatataag cgatagcgat attaagacct 300
ctggaagcgt atctgacaaa gaaaatggag ggataacagc cagcgcagta gtcagtgaat 360
ttggtggcac catctttatg aatggtgata attcagtcga gtcgggtggg gcatattcag 420
cgggactttt aagccagggt aatgattctg aaaagatggt aaataacacc cgtcttgaaa 480
ccacagataa aacgaacatt gttacctctg gggaaaatgc agtaggtggt cttgcatggt 540

caagtcctgg agagtctcga acatgtgtcg atgctgtaga tgatgaagtt agtgattcta 600
 acagttacga agttattagc cgtgctgatt taaaaatgaa tgggtggtcc ataacaacta 660
 atggcattaa tagctatggt gcttatgcta atgggaaaaa agcatatatt aatttagatt 720
 atgtggcact tgaaactgtg gctgatg 747

<210> 143
 <211> 621
 <212> DNA
 <213> Escherichia coli

<400> 143
 agcctggtga cgacttatct ggtggtgctg aacttcgcga ttttgccgag cctccagcag 60
 tttaataaag tcctcgcgta cgaagtgcgt atgttgatga ccgacaaact gcaactggag 120
 gacggcacgc agttggttgt gcctcccgtt ttcgctcggg agatctaccg tgagctgggg 180
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 gaattcttaa gccatcagat ggcgagcaa ctgggcggcc cgacggaagt gcgcgttgag 300
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 cgcgtagccg tgaccgaaat tcatacgggc gatttctctc cgctgttccg ctatacgtg 420
 gcgattatgc tattggcgat aggcggggcg tggctgttta ttcgtatcca gaaccgaccg 480
 ttggtcgcgc tcgaacacgc agccttgtag gttggtaaag ggattattcc gccgccgctg 540
 cgtgagtatg gcgcttcgga ggtgcgttcc gttaccctg cctttaacca tatggcggtc 600
 ggtgttaagc aactggcgga t 621

<210> 144
 <211> 449
 <212> DNA
 <213> Escherichia coli

<400> 144
 accacgacag gtctttatga tctgaaaacc gaaaatacct tgtaactac cgatgctgca 60
 ttcgataaat tagggaatgg cgataaagtc accgttggcg gcgtagatta tacttacaac 120
 gctaaatctg gtgattttac taccaccaa tctactgctg gtacgggtgt agacgccgcg 180
 gcgcaggcta ctgattcagc taaaaaacgt gatgcgttag ctgccaccct tcatgctgat 240
 gtgggtaaat ctgttaatgg ttcttacacc acaaaagatg gtactgtttc tttcgaaacg 300
 gattcagcag gtaatatcac catcggtgga agccaggcat acgtagacga tgcaggcaac 360

ttgacgacta acaacgctgg tagcgagct aaagctgata tgaaagcgct gcttaaagcc 420
gcgagcgaag gtagtgacgg tgcctctct 449

<210> 145
<211> 704
<212> DNA
<213> Escherichia coli

<400> 145
atggaattgc gtctgttcaa ctatctggtc gagcgtaaag atctgattca gatcccggtg 60
tatccgttcg aacgcgaatg gacgcacttc accagcatga cttacattga tgagttttca 120
gagctgcatg gcaaagatgt tccggtgcgt gaagccctcg ccggacaagt gcccagcgca 180
ggcgtcggca cctgtttcag ccgccgcgcc gtgaccgcac tgtagctga cggtgacggt 240
attgctttcg acgtgcagag tcttactgaa gattacgaca ttggcttccg cctgaaagaa 300
aaaggatga cggaattttt tgtccgtttt ccggtggtgg acgaagccaa agaacgcgag 360
cagcgtaaatt ttttacagca cgcgcggaaca tcaaacatga tctgcgtgcg cgaatatttc 420
cccgatacct tttcgactgc ggttcgacaa aaatcccgct ggatcatcgg cattgttttc 480
caaggcttta aaaccataa atggacctcc agcctgacgc tgaactactt tctctggcgc 540
gaccgcaaag gggcaatcag taactttgtc agcttcctcg cgatgctggt gatgatccag 600
cttttgcgtg tgctggcgta tgaaagttag tggcccgatg cctggcattt cctttctatt 660
ttcagcggca gcgcatggtt aatgaccctg ctgtggctaa actt 704

<210> 146
<211> 251
<212> DNA
<213> Escherichia coli

<400> 146
ataatcctcg tcatttgtag attatggaac tcgagggggc gcagctcccg cgcgtactgg 60
atgatcccaa agttgatgta gcgattatca gcaccactta cattcagcag accgggcttt 120
ctccggtgca cgacagcgta tttattgaag ataagaattc gccgtatgtg aatatttttg 180
tggcacggga agataataag aatgcagaaa acgtgaagga atttctgcaa tcttatcaat 240
caccggaagt c 251

<210> 147
<211> 423

<212> DNA

<213> Escherichia coli

<400> 147

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ctctgtccct cagttctacg acggtctctg ccgctgccac gacggttaat ggtgggaccg      60
ttcactttaa aggggaagtt gttaacgccg cttgcgcagt tgatgcaggc tctgttgatc      120
aaaccgttca gttaggacag gttcgtaccg catcgtctggc acaggaagga gcaaccagtt      180
ctgctgtcgg ttttaacatt cagctgaatg attgcgatac caatgttgca tctaaagccg      240
ctgttgccct tttaggtacg gcgattgatg cgggtcatac caacgttctg gctctgcaga      300
gttcagctgc gggtagcgca acaaacgttg gtgtgcagat cctggacaga acgggtgctg      360
cgctgacgct ggatggtgcg acatttagtt cagaaacaac cctgaataac ggaaccaata      420
cca                                                                423
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<210> 148

<211> 768

<212> DNA

<213> Escherichia coli

<400> 148

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gactcgttac agcgattgcg gcaactggcg caacaaaccg gctcgtgaa gtcacaaacc      60
gaacagaaag ttattaccac aacgaagaaa gctgtaccgg taaaacagac agtcacggca      120
cccgtcatac catccaatac agttttaact gccaaacccg tcattacaga gccggcaaca      180
accgtcattt ccattgagcc cgccaatcct gatgtggtct atattcccaa ctacaaccca      240
accgtggttt acgggaactg ggccaatact gcgtatccgc cggtttatct gccaccacca      300
gccggagaac cgtttggtga cagctttgta cgcggattcg gctatagcat gggcgttgct      360
accacgtacg cactattcag cagcatcgac tgggacgacg acgatcatga ccatcatcat      420
catgacaatg atgattatca tcaccacgat ggcggtcatc gtgacggtaa tggctggcaa      480
cacaacggcg acaacatcaa tatcgacgtc aacaatttca accgtatcac cggtgagcat      540
cttactgata agaatatggc atggcggcac aatccaaact accgtaatgg tgtgccctat      600
catgatcagg atatggcaaa gcggtttcat caaacggatg tcaacggcgg aatgagcgcc      660
acgcaattac ctgccccaac gcgcgacagc cagcgtcagg cggcagcaaa tcagtttcag      720
caacgaacac acgccgcacc agtcattaca cgagataccc aacgtcag                      768
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<210> 149

<211> 788

<212> DNA

<213> Escherichia coli

<400> 149

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ctttacgacg gttctcccca ggactgaaag cccagtttgc cttcggcatg gtctttttgt      60
tcgttcagcc cgatgccagc gctgctgaca taagtgcgca gcaaataagg ggggtgatta      120
ttccgcaggc cttcagtcag gcgcttcagg acggcatgag cgtcccgtc tatattcatc      180
tcgccggtag ccagggtcgc caggacgac agcgaatcgg cagcgctttt atctggctgg      240
acgatggaca gctacgcac cggaaaatac agctggaaga gagtgaagat aacgccagt      300
tcagcgaaca aactcgacag cagctgatgg ctctggccaa cgccccgttc aatgaggccc      360
ttaccatccc cctgactgac aacgcgcagc tggatctcag cttgcgcaa ctgctgctgc      420
agctagtggg caagcgcgaa gcgctgggca ccgtactacg ctcacgtagc gaagacatcg      480
ggcagtccag tgtaaacacc ctcagcagta atctgagcta taacttgggc gtctataaca      540
accagttgcg taacggcggg agcaacacat ccagctatct gtcgctgaat aacgttactg      600
cactgcgcga acatcatgtg gtgctcgacg gtcgctgta cgggatcggg agcgggcaac      660
aggacagtga attatataaa gcgatgtatg aacgcgattt tgccggtcac cgatttgccg      720
gtggaatgct cgacacctgg aacttgcagt ccttagggcc gatgaccgcc atttcagcag      780
ggaagatt                                         788
```

<210> 150

<211> 750

<212> DNA

<213> Escherichia coli

<400> 150

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ttgaaacttc ttactgcgcg attttttagca gcgagtcccg cggcgaagag tgctgttaat      60
aacgcctatg atgcattgat tattgaagct cgcaagggtg atactcagcc agctttgtca      120
tggtttgcac taaaatcagc actcagcaat aaccaaattg ctgactgggt acagattgcc      180
ttatgggccg ggcaagataa acaggttatt accgtttaca accgctaccg tcatcagcaa      240
ttaccagcgc gtggttatgc agctgtcgcc gtcgcttatc gtaacctgca acaatggcaa      300
aactcgctta cactgtggca aaaggcgtc tctctggagc cgcaaaataa ggattatcaa      360
cggggacaaa ttttaacctt ggcagatgct ggtcactatg atactgcgct gggttaaactt      420
aagcagctta actctggagc accggacaaa gccaatctac tcgcagaagc ctatatctat      480
aaactggcgg ggcgtcatca ggatgaatta cgggcgatga cagagtcatt acctgaaaat      540
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gcactctacgc aacaatatcc cacagaatac gtgcaggcat tacgtaataa tcaacttgct 600
gccgcgattg acgatgcaa tttaacgcca gatattcgcg ctgatattca tgccgaactg 660
gtcagactgt cgtttatgcc tacgcgcagt gaaagtgaac gttatgccat tgccgatcgc 720
gccctcgccc aatacgcctgc attagaaatt 750

<210> 151
<211> 733
<212> DNA
<213> Escherichia coli

<400> 151
atagcagggc tgtttgatc atctctaagt tatgcagaaa acacggagat cccttcttat 60
gaagaaggga tctcgtcttt tgatgttgaa gccactctgc aaccagatgg ggtgctcgac 120
atcaaagaaa atattcatatt tcaggcgcga aatcagcaga ttaagcacgg cttttatcgt 180
gatttaccac gactatggat gcagcctgat ggggacgctg cactgctgaa ctatcatatt 240
gttggcgtca cccgtgatgg tattcctgaa ccctggcatc ttgactggca tatcgggtta 300
atgagtattg tcgtgggcga taaacaacgt ttcttgctc aaggcgacta tcattatcaa 360
attcattatc aggttaaaaa tgctttcctg cgtgaggggg attctgatct gctaactctg 420
aacgtgaccg gtaaccactg gccgtttgaa atttataaga cccgtttttc tctccagttc 480
tctaataattg cgggtaatcc atttagcga atcgatcttt ttaccggaga agagggcgac 540
acatatcgta atggccgcat ccttgaggac ggaagaattg aatcccgcga tccgttttat 600
cgtgaagatt tcacggtcct ctaccgctgg cctcacgctt tacttagcaa tgccctcggt 660
ccgcaaacga cgaatatatt cagccatctt cttttaccct ccacgtcatc gttgttaatt 720
tggtttccgt gtc . 733

<210> 152
<211> 756
<212> DNA
<213> Escherichia coli

<400> 152
tattgtcatc gcgcagagtc tcacgatgcg ggcgatatca gctttagcga tatctttcgt 60
ggcccggctt ccatctttgg cggcattgag tatcaaacgc cgtggaatcc cctgcgtctg 120
aaactcgaat acgatggaaa caattaccag aatgatttcg ctggcaaact gcctcaggca 180
agccatttca acgtcggcgc agtttatcgc gctgccagct gggcagatct caacctgagt 240

tatgaacgcg gtaacacggt gatgtttggc ttcacgttac ggaccaatth caacgatctg	300
cgccttgccc tgcgcgatac gccaaaaccg gcatatcaac ctgcgcctga atctgaagga	360
ttgcagtaca ccacggtagc aaaccaactt accgcctga agtataacgc gggctttgac	420
gcgccagaaa ttcagctacg cgataagaca ctgtatatgt ctggtcagca atacaaatac	480
cgtgactctc gtgaagcggg cgatcgtgcc aaccggatc tgggaataa cctgccgcaa	540
ggcgttgaga agattagcgt gacgcaaaag cgcgagcata tggcgatggg gactaccgaa	600
accgacgtag ccagcctgcg caaacagctg gcaggtacag cgctgggtca atcagagcca	660
ctgcaacaac aacgtgttga agctgaagat ctttctgcct ttggctcggg ctaccgtatt	720
cgtgaagatc gcttttagcta ctctttcaac ccaaca	756

<210> 153
 <211> 735
 <212> DNA
 <213> Escherichia coli

<400> 153	
gaataccaaa gcagatcgtc tcgctgaatt aaaaatccgt tcgccctcaa ttcaactgat	60
aaaatttggc gctattgggt tgaatgcaat tatcttttcc ccctgctga tagctgctga	120
tacaggaagt caatatggca ccaatattac tattaatgat ggtgacagaa ttacaggaga	180
taccgccgat ccacaggaa acctctatgg tgtaatgacc ccagcaggaa acacgcctgg	240
caatatcaac ctgggtaatg atgtcacctg caatgtcaac gacgcctctg gatatgcaaa	300
aggaatcatt attcaggga aaaacagctc cctgacagct aaccgactca cagtagatgt	360
tggttggtcaa acctctgcca tcggcattaa cttaattggg gactataccc atgctgactt	420
aggcacaggc agcaccatta agagtaacga tgacggcatc attattgggc atagctcaac	480
actaacagcc actcaattca ccattgaaaa ctggaacggg ataggcctaa ccatcaatga	540
ctatggcacc agtgctgatc ttggaagcgg aagtaaaatc acgaccgatg gaagtacagg	600
tgtttatatc ggtggtctca acggcaataa cgccaatggg gctgcgcgtt ttacggctac	660
agacctgaca atcgatgttc agggctacag cgccatgggg ataaacgtac agaaaaactc	720
tggtgtcgat ctg	735

<210> 154
 <211> 509
 <212> DNA

<213> Escherichia coli

<400> 154

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ctaactcatt gtggtggagc ccaaacatga ttactcatgg tttttatgcc cggacccggc      60
acaagcataa gctaaaaaaa acatttatta tgcttagtgc tggtttagga ttgttttttt      120
atgttaatca gaattcattt gcaaatggtg aaaattattt taaattgggt tcggattcaa      180
aactgttaac tcataatagc tatcagaatc gcctttttta tacgttgaaa acaggtgaaa      240
ctgttgccga tctttctaaa tcgcaagata ttaattttatc gacgatttgg tcgttgaata      300
agcatttata cagttctgaa agcgaaatga tgaaggccga gcctggtcag cagatcattt      360
tgccactcaa aaaacttccc tttgaataca gtgccttacc acttttaggt tcggcacctc      420
ttgttgctgc aggtggtgtc gctggtcata caaataaaact gactaaaatg tccccggacg      480
tgaccaaaag caacatgacc gatgacaag                                     509
```

<210> 155

<211> 338

<212> DNA

<213> Escherichia coli

<400> 155

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ggcgttacta tcctctctat gtgcacacgg agctcctcag tctattacag aactatgttc      60
ggaatatcac aacacacaaa tatatacgat aaatgacaag atactatcat atacggaatc      120
gatggcaggc aaaagagaaa tggttatcat tacattttaag agcggcgcaa catttcaggt      180
cgaagtcccg ggcagtcaac atatagactc ccaaaaaaaaa gccattgaaa ggatgaagga      240
cacattaaga atcacatatc tgaccgagac caaaattgat aaattatgtg tatggaataa      300
taaaaccccc aattcaattg cggcaatcag tatggaaa                                     338
```

<210> 156

<211> 500

<212> DNA

<213> Escherichia coli

<400> 156

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tttgttgtaa ttggtacttc attcctgaaa atttctattg tactggggat attgaagaac      60
gcattaggca ttcaacaggc accaccaaac atggcgctaa catcagtgtc ttgatactg      120
acaatgttta ttatgtctcc gataatatta cagataaatg ataatatctc tcaggaacca      180
atcaattata ccgactctga tttttttcaa aaagttgatg agaaaatatt atcaccatat      240
cgcggtatct tagaaaaaaa tacagagaaa gacaatgtag agttttttga acgtgcagct      300
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caaaaaaaaaat tgggtaaatga aactatctta aaaaaagact ctctatztat actggtaccg 360
gctttcacga tggggcagct tgaagctgca ttcaagatag gttttttgct ctatttacct 420
tttattgcga tagatttgat catttccaat atcttattgg ccttgggtat gatgatggta 480
tcgccagtaa caatttcgat 500

<210> 157
<211> 503
<212> DNA
<213> *Escherichia coli*

<400> 157
ttacgcttcc gatcatagta gagaactata cattttcggg aaaattgcc tctggaatct 60
ttcagttgac aggaatagtg ctaaaagaaa taagtattgg ttttttcatt gggttatcat 120
ttactattct tttttgggca atagatgcgg ctgggcagat tattgatact ctaagagggt 180
caacaatata ttcaattttt aaccgcgtca taagtattc atcttctatc actggcggtta 240
ttttgtacca atttatctct gtgatctttg ttattcatgg tgggatacaa agcattctgg 300
ataagctata tttatcctac gagatattac cattacaagc cgatattgca ttcaatcgtg 360
ctttaataga ttttttggtt tctctatggg attcatttat taaactgatg ttatcatttt 420
cagttcccat gattatcggg atattcttat gtgatatggg gtttgggttt cttacaaaaa 480
cagcgcctca actaaacgta ttc 503

<210> 158
<211> 617
<212> DNA
<213> *Escherichia coli*

<400> 158
aagtgaagag gtaatggctg cagtgcagtc attaatctta ttttcatttt tttctttata 60
tggcatgagt ttttttggtg atatagttgg gttagttaat acgacaatag actcgctaaa 120
tagaccgttt ttgtatgcc ttcgagaaat attaggtgcg gtgttaaata tatttttatt 180
atatattttg ccaatttctt tgattgtctt tgttggaact gttacgactg gtgtatcaca 240
aataggattc atctttgcgg ttgaaaaaat aaaaccatcg gctcagaaga ttagtgtaaa 300
aaataacctg aaaaatatat tttctgtaaa gagcattttt gagctactta aatcagtatt 360
taagttagtg ataattgttc tcatttttta ttttatgggg cattcatatg caaatgagtt 420
tgctaatttc acaggactga acgcatatca agctcttgtc gttgttgcc tttttgtttt 480

tcttttatgg aaaggcgtgc tattcggata tctactcttt tcagtatttg atttctggtt 540
ccagaagcat gagggactga agaaaatgaa aatgagtaaa gatgagggtga aacgagaagc 600
caaggatact gatggtg 617

<210> 159
<211> 740
<212> DNA
<213> Escherichia coli

<400> 159
gatggtgact ctattgcagg attaccaaca aaaacaattg gcgcaaagct atcagattca 60
gcaggccggt tttgagagcc agaataaagc tattgaggaa aaaaaagccg cggcaaccgc 120
tgctttggtt ggcgggatta tttcatcagc attggggatc ttaggttctt ttgcagcaat 180
gaacaacgcg gctaaagggg ctggtgagat tgctgaaaaa gcaagctctg catcttcaaa 240
ggctgctggt gcggcttctg aggttgcaaa taaagctctg gtcaaggcta cggaaagtgt 300
tgctgatgtc gcagaggagg catccagtgc gatgcagaaa gcgatggcca caacaacgaa 360
agcagccagc cgtgcactctg gcgttgcaaa tgatgttgcg aaagccactg actttgctga 420
agatcttgca gacgccgcg agaagacaag cagaatcaat aagttgttga attccgtaga 480
taaactgacc aataccacag catttggtgc cgtgaccagt cttgctgaag gtacgaaaac 540
gttgccaaca acaatatctg agtccgtcaa atcgactcat gaggttaatg aacaacgtgc 600
gaagtcgctg gaaaacttcc agcaggggaa tctggagctg tataaacaag acgttcgcag 660
aacgcaggat gatatcacga ctgctctgcg tgatataacg tccgctgtcc gcgatctcct 720
tgagggtccag aatcgtatgg 740

<210> 160
<211> 717
<212> DNA
<213> Escherichia coli

<400> 160
tgtttgaggt cactttctgg tggcgtgatc cccaagggtc tgaagaatac tcgacgataa 60
agcgcgtatg ggtctacatc actggtgtga ccgatcacca tcagaacagc cagccccagt 120
cgatgcagcg aattgcaggc actaacgtct ggcatggac gacacaactc aatgccaaact 180
ggcgcggcag ctactgcttt attcccaccg aacgcgatga cattttttct gtaccatccc 240
ccgatcgct cgaattgccc gaaggctggc gaaaactatt accccaggcg atagccgatc 300

cgctgaacct acaaagctgg aaaggcgggc gagggcacgc tgtttctgca ctcgaaatgc 360
cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc gccagaaata cctgccaaag 420
aaattatctg gaaaagtga aaggttga aagtcacggcg tgtatggatt tttaccaccg 480
gcatgcaac agcagaagaa cgcccgctgg cagttttgct cgatggcgaa ttttgggcgc 540
aaagtatgcc cgtctggcca gtgctgactt cgctgacca tcgtcagcaa cttcctcccg 600
ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg cgcccacgaa ctgccgtgta 660
atgcggatth ctggctcgca gtacagcaag agttattacc cctggtgaaa gctattg 717

<210> 161
<211> 379
<212> DNA
<213> Escherichia coli

<400> 161
tgtttctgca ctcgaaatgc cgcaagcgcc tctgcaaccg ggatgggatt gtccgcaagc 60
gccagaaata cctgccaaag aaattatctg gaaaagtga aagtcacggcg 120
tgtatggatt tttaccaccg gcatgcaac agcagaagaa cgcccgctgg cagttttgct 180
cgatggcgaa ttttgggcgc aaagtatgcc cgtctggcca gtgctgactt cgctgacca 240
tcgtcagcaa cttcctcccg ccgtgtatgt gttgatcgac gctatcgaca ccacgcaccg 300
cgcccacgaa ctgccgtgta atgcggatth ctggctcgca gtacagcaag agttattacc 360
cctggtgaaa gctattgcc 379

<210> 162
<211> 402
<212> DNA
<213> Escherichia coli

<400> 162
tatgctgctc caactattcc tcaggggcag ggtaaagtaa cttttaacgg aactgttggt 60
actgctccat gcggcatttc tcagaaatca gctgatcagt ctattgattt tgggcagctt 120
tcaaaaagct tccttgccgc aggaggtgta tccaaaccaa tgaatttaga tattgaattg 180
gttaattgtg atatcacttc atttaagggg gggggaggaa gccaggcagc aaaaaaggg 240
actgtgaagc tggcttttag tggccaagg gtttctggtc ataagttaga gttagatacc 300
agcgggggga caggactgc aattgcagtt caggccgcag gtaaaaacgt ttctttcgat 360
ggcacagaag gtgatgctaa taccctgaaa gatggagata at 402

<210> 163
<211> 724
<212> DNA
<213> Escherichia coli

<400> 163
cttggaatg ttggtaaagc tgtttcgcaa tatattctgg ctcagagaat ggcacagggg 60
ttatcgacaa cagctgcaag tgcgggtctg atcacatcgg ctgttatgct ggctatcagt 120
cctctttctt tcttggtgc tgcagataaa tttgagcgag ctaagcagct tgaatcatat 180
tctgaacgat ttaaaaaatt gaattatgaa ggggatgctt tactcgcagc ctttcataaa 240
gaaaccggag ctatagatgc agccctgaca acaataaata ctgtcctgag ttctgtatct 300
gcgggagtta gtgcagcctc cagtgcattc ctcatagggg ccccgataag catgctggtg 360
agtgcattaa ccggtacgat atctggcatt ctggaagcat caaacaggc tatgtttgag 420
cacgttgtag agaaattcgc tgctcggatc aatgaatggg aaaaggagca tggcaaaaat 480
tattttgaga atggatatga cgcaagacat gctgcgtttt tagaagactc tctgtctttg 540
cttgctgatt tttctcgtca gcatgcagta gaaagagcag tcgcaataac ccagcaacat 600
tgggatgaga agatcgggtga acttgtaggc ataaccgta atgctgatcg cagttagagt 660
ggtaaggcat atattaatta tctggaaaat ggagggttt tagaggctca accgaaggag 720
ttaa 724

<210> 164
<211> 618
<212> DNA
<213> Escherichia coli

<400> 164
tcaatgctga aactataagg catcagtata atacccacac acaagatttt ggggtgactg 60
aatggttact ggcagcgaag tctattggct taaaagcaaa atatgtagaa aaacattttt 120
ccagattgtc aataatttct ttacctgcgt tgatatggcg ggatgacggg aagcattata 180
tattgtctcg tattactaaa gattcatcac gctatcttgt ttatgatcca gaacaacatc 240
agtcactaac ttttagtcgg gatgagtttg aaaaactgta tcagggaataa gtcattctgg 300
ttacgtcaag agcaacagta gtcggagagt tagctaaatt tgatttttct tggtttatcc 360
cctctgttgt gaaatacagg aggattttac ttgagggtgt aactgtttct gcttttatcc 420
agtttcttgc gttaataaca cctctttttt ttcagggtgt aatggataag gttttagttc 480

accgggggtt ttcaacgtta aatattatca caatagcatt tattatagtg atactttttg 540
aagtgatatt aaccggagcc agaacttata ttttctctca tactacaagt cgtattgacg 600
tcgaactggg tgctaagt 618

<210> 165
<211> 768
<212> DNA
<213> Escherichia coli

<400> 165
catcaggcag ttatcctgtc gactttacca ctctctcccg gcttattatt gataagctcc 60
ggcatcaact ttttctgcca gttccctctc gcgaaacttt ccaccaacgc gtgctggaaa 120
gctacgccca tacgcaacag acaattgatg cccgccatga ctgggccatc ctgcgtgaaa 180
aagcgttgaa ttttggcgag gctgagcagg cactgctgac aggacacgct ttccaccctg 240
cacctaagtc tcatgaaccg tttaaccgcc aggaagctga acgatacctg cctgacatgg 300
cacctcactt cccgctgcgg tggttttcgg tggataaaac gcaaactcgt ggtgaaagtc 360
tgcactttaa cttcaacag cggttgacgc gatttgccgc agaaaatgcg cccagttac 420
tcaacgaatt aagtgacaat caatggctgt tcccgtgcg cccgtggcag ggagaatata 480
ttttccagca agtgtggtgc caggcacttt ttgctaaagg acttatcaga gacttaggcg 540
aggccggcac gtcgtggtg ccgaccacct cttcccgtc cctctactgt gctaccagcc 600
gcgatatgat caagttctcc ctgagcgttc ggctgaccaa ctccgtccgt actctgtctg 660
tgaaagaggt ggagcgagga atgcgcctgg cacgtctggc gcaaaccgac ggctggcaga 720
tgctacaggc ccgcttcctt actttccggg taatgcagga ggacgact 768

<210> 166
<211> 501
<212> DNA
<213> Escherichia coli

<400> 166
ttcacagcgg atatggactg cgctgtgaaa aactcgacaa gcctctgaat cttggctggg 60
ggctggacaa tagcgcggtg ttgactggc ccggggagct gccaacaggg tggctgtgcg 120
acgcgctgga tcagatatct atcgccgcac cacaactttc agcagtgggt cttccctggt 180
ccgaatggtg tgaggagcca caggcgtga cgcttttcgg acaggtacaa agcgacatta 240
tccatcgctc cgctttctgg cagttaccgt tatggctgag ttctccggca aaccgggcct 300

ccggtgaaat ggtttttgat gcagagcgtg agatttatTTT cccgcagcgc cccccccgTc 360
 cgcagggtga agttttatcgt cgttacgac caccgattcg caggatgctg agtttccgca 420
 ttgccgatcc cgttttctgat gcagaacgTt tcactcgtg gatgaacgat ccgcgcgttg 480
 agtatTTTctg ggagcaaagt g 501

<210> 167
 <211> 721
 <212> DNA
 <213> Escherichia coli

<400> 167
 agactgggat ttggtcaacc gccgcctggt ggcaaaaatg ttgtctgagc tggagtatga 60
 gcaggttttc caccgcgaat ctcaaggcga tgaccgctac tgcattaacc tgccgggagc 120
 acaatggcgc ttcatcgtg aacgtggtat ctggggctgg ctctggattg atgtctaaac 180
 tctgcgctgc gcggacgagc cagtactggc tcagacgctg ctgatgcagc taaagcaggt 240
 actgtcaatg agcgatgcaa ccgttgctga gcatatgcag gatttgatg ccacgtgct 300
 gggcgacctg caactactga aagcccgtcg cgggctgagc gccagtgacc tgattaatct 360
 taatgccgac cgctgcaat gcctgctgag cggtcaccc aaattcgTtt ttaataaagg 420
 tcgccgtggc tggggtaaag aggcgctgga acgatatgcg ccagagtatg ccaacacctt 480
 cagactgcac tggctggcgg taaaacgtga acatatgac tggcgctgtg ataacgagat 540
 ggatattcat cagttgttga cggccgcaat ggatccgcag gagtttgccc gcttcagtca 600
 ggtctggcag gaaaacggac tggatcataa ctggctgccg ctgccggTac atccgtggca 660
 gtggcaggaa aaaatcgcta ccgacttcat cgctgatttt ggCGaaggca ggatggtgTc 720
 t 721

<210> 168
 <211> 719
 <212> DNA
 <213> Escherichia coli

<400> 168
 ggagtatatT gcgtgggtag tattcccca aaaggttatg accaaaaatg gatatccctt 60
 atttattgag gttcataata aaggtagctg gagtgaggag aatactggtg acaatgacag 120
 ctatTTTTtt ctcaaggggt ataagtggga tgagcgggcc tttgatgcag gtaatttTgtg 180
 tcagaaacca ggagaaacaa cccgtctgac tgagaaattt gacgatatta tttttaaagt 240

cgccctacct gcagatcttc ctttagggga ttattctggt acaattccat acacttccgg 300
catgcagcgt catttcgcga gttacttggg ggcccgtttt aaaatcccat acaatgtggc 360
caaaactctc ccaagagaga atgaaatggt attcttattt aagaatatcg gcgcatgccg 420
tccttctgca cagtctctgg aaataaagca tggatgatctg tctattaata gcgctaataa 480
tcattatgcg gctcagactc tttctgtgtc ttgcgatgtg cctgcaaata ttcgttttat 540
gctgttaaga aatacaactc cgacatacag ccatggtaag aaattttcgg ttggtctggg 600
gcatggctgg gactccattg tttcggttaa cggggtggac acaggagaga caacgatgag 660
atggtacaaa gcaggtacac aaacctgac catcggcagt cgctctatg gtgaatctt 719

<210> 169
<211> 561
<212> DNA
<213> Escherichia coli

<400> 169
aaatgaatgt ctggactcaa cgtggatttc atcaaaagga aactatattc agaagtttga 60
aaataaattt gcggaacaaa accatgtgca atatgcaact actgtaagta atggaacggt 120
tgctcttcat ttagctttgt tagcgttagg tatatcgga ggagatgaag ttattgttcc 180
aacactgaca tatatagcat cagttaatgc tataaaatac acaggagcca ccccatttt 240
cgttgattca gataatgaaa cttggcaaat gtctgttagt gacatagaac aaaaaatcac 300
taataaaact aaagctatta tgtgtgtcca ttatacggga catccatgtg atatggaaca 360
aattgtagaa ctggccaaaa gtagaaattt gtttgaatt gaagattgag ctgaagcctt 420
tggttctaaa tataaaggta aatatgtggg aacatttga gatatttcta cttttagctt 480
ttttggaaat aaaactatta ctacaggtga aggtggaatg gttgtcacga atgacaaaac 540
actttatgac cgttggtttac a 561

<210> 170
<211> 750
<212> DNA
<213> Escherichia coli

<400> 170
agcagcatca ggttctgagc tgcattgcga atcaaatgac aacggaagat attctggaga 60
aactgaaaat atcgctaaaa acgctctact gccataaaca caatatcatg atgacctca 120
atcttaagcg gatcaatgag ctggtacgcc atcagcatat taattatctg gtgtgaacga 180

ttgaacaata taaagaggcc cagcaacagc cagacctccc gttaattata cgttatgcag 240
taacgccttc cggtatcaac gaagcaattht gcttacgcc a ttgcgcttgc tcctgttcac 300
cttctgtacg ttgaccataa agttgcgcta tctgcgtacc atcatgggca aacaattcca 360
gactgggttac gtgaccatcg ctggctcggtt tacgggtaac ccaggcttca gcaatgctct 420
cttctaatag atgaagggt aacgtcgggt tgaatatatt cagccaacct ttcattggca 480
ccactttttc taccacaccg gtgaaaatct gtacgcagcc acggttgcca acaaacacca 540
tgatttcatt gccatcctgc tgtgcagatt caagaatttg cgccaacgca ctgttgata 600
ctttgcaggc caaatcgtct gccaccagat tgaacgcctg ttggcgcgtc aggttgtggc 660
gcttgagcaa cgtaaaaaac tgatgaacgt cggtcacgc ccgccactct tgctcgacca 720
cactggcatc ggctcgcgtt tgaacaactg 750

<210> 171
<211> 616
<212> DNA
<213> Escherichia coli

<400> 171
ttcttcggta tcctattccc gggagtttat gatagacttt tcgaccaaac aaagttatgt 60
ctcttcgta aatagtatac ggacagagat atcgaccctt cttgaacata tatctcaggg 120
gaccacatcg gtgtctgta ttaaccacac cccaccggc agttattttg ctgtggatat 180
acgagggctt gatgtctatc aggcgcgttt tgaccatctt cgtctgatta ttgagcaaaa 240
taattttatat gtggctgggt tcgttaatac ggcaacaaat actttctacc gtttttcaga 300
ttttacacat atatcagtgc ccggtgtgac aacggtttcc atgacaacgg acagcagtta 360
taccactctg caacgtgtcg cagcgtgga acgttccgga atgcaaatca gtcgtcactc 420
actggtttca tcatatctgg cgttaatgga gttcagtggt aatacaatga ccagagatgc 480
atccagagca gttctgcgtt ttgtcactgt cacagcagaa gccttacgct tcaggcagat 540
acagggagaa tttcgtcagg cactgtctga aactgtcctt gtgtatacga tgacaccgga 600
agaagtggac ctcaca 616

<210> 172
<211> 613
<212> DNA
<213> Escherichia coli

<400> 172
 aaatggcgac aaattatacc gtgctgactc tagaccccca gatgaaataa aacgttccgg 60
 aggtcttatg cccagagggc ataatgagta cttcgataga ggaactcaaa tgaatattaa 120
 tctttatgat cacgcgagag gaacacaaac cggctttgtc agatatgatg acggatatgt 180
 ttccacttct cttagtttga gaagtgtcct cttagcagga cagtctatat tadcaggata 240
 ttccacttac tatatatatg ttatagcgac agcaccaa atgtttaatg ttaatgatgt 300
 attaggcgta tacagccctc acccatatga acaggagggt tctgcgttag gtggaatacc 360
 atattctcag atatatggat ggtatcgtgt taatttttgt gtgattgatg aacgattaca 420
 tcgtaacagg gaatatagag accggtatta cagaaatctg aatatagctc cggcagagga 480
 tggttacaga ttagcagggt tcccaccgga tcaccaagct tggagagaag aaccctggat 540
 tcatcatgca ccacaagggt gtggagattc atcaagaaca attacagggt atacttgtaa 600
 tgaggagacc cag 613

<210> 173
 <211> 227
 <212> DNA
 <213> Escherichia coli

<400> 173
 aagaagatgt ttatggcgggt tttatttgca ttagtttctg ttaatgcaat ggcggcggat 60
 tgcgcgtaaag gtaaaattga gttttccaag tataatgaga atgatacatt cacagtaaaa 120
 gtggccggaa aagagtactg gaccagtcgc tggaatctgc aaccgttact gcaaagtgtc 180
 cagttgacag gaatgactgt cacaatcaaa tccagtacct gtgaatc 227

<210> 174
 <211> 260
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 174
 ccactttttc tactttctaaa acttcagcaa gtgtttcacg taacttgcta gaacgagtaa 60
 tttttatatc gtccttacca tcatttttgt ctatggtaaa tatattcata ttattttctt 120
 ctttaaatat tgctgcatgt actgtaaaact tadcgtagtc aatcatagtt agtactgtat 180
 ctaggtgcat aaatgtgcgt gtattaggta tttcaatagc tacgattttt ttaaaacttg 240
 tgtttgcatc ttgaaaata 260

<210> 175
 <211> 422
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 175
 ttgataacaa acaaattctg ctatttcatt tgaagaagtc aaaatcatca aagtatcggt 60
 acctccaata gttcctaata tttctttcat ttgtaattga tctatgtaat aacttatact 120
 ttgagcaaag ccaggagatg tttttattaa gacatagtta tttagcgta taaattcaat 180
 aatctcatca ctaaataattt ctaattgttt ttttgcaatt aattgatttg tttgatttat 240
 tttcttgtaa atatactttt tattttcaac agggattttg taaatttcta attcttgtaa 300
 gtcacgagaa atagttgtca agctatagta aactccaaaa tgtcttgcca tgtaatccac 360
 tatttgttgt tttttattaa actgattctg ttgtataaca gttaagataa gatttaaacg 420
 tt 422

<210> 176
 <211> 322
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 176
 taacactgaa cccaatgac ctacaatatg ttctaatact tgtgccattg atggattagc 60
 aagttttgaa atttggttct gctgaatgac accttgggct agtacagtca ttaagaaata 120
 aatgactagc acagaaatca aaccaataac ggtagcagtt cctacatcct ttttagactt 180
 tgcacgtcca gaaaagacaa cggctccttc aatccctgtg aatacccata cagtactaa 240
 catagtactt tttacttgtg ccattgtatc tccccaacta aaaacgcaa cacttcact 300
 agtcatacca taaaaaccgg at 322

<210> 177
 <211> 733
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 177
 cctcaaacaa gcagaaaaag ctaaaagcga agttacacaa tcaactacaa atgtatctgg 60
 tacacaaaca tatcaagacc ctaccaagt tcaacctaaa caagacacac aaagtactac 120
 atatgatgca tcattagatg aatgagtagc ttataatgaa atttcatcaa atcaaaagca 180
 acaatcttta tcaacagatg atgcgaatca aatcaaacg aattctgtta caaaaaatca 240

acaagaagaa acaaatgatt tgacacaaga agataaaaca tccactgata caaatcaatt 300
acaggagaca caatctgtag caaaagaaaa tgagaaagat ttaggagcta acgcaaataa 360
tgaacaacaa gacaagaaga tgactgcaag tcaaccttcc gaaaatcaag caattgaaac 420
tcaaactgct tctaatagata atgaaagcca aaaaaaaagt cagcaagtaa cttctgaaca 480
aaatgaaact gctacaccta aagtatcaaa tacaacgcga tctggttata attttgatta 540
cgatgatgaa gacgatgata gctcaacaga ccatttagag cctatctcat taaacaatgt 600
gaatgctaca tctaacaacaa ctacttcata taaatataaa gaaccagctc aacgtgtaac 660
aactaatact gtaaaaaaag aaacggcatc taatcaagcg actatagata caaagcaatt 720
caccccattht agt 733

<210> 178
<211> 507
<212> DNA
<213> Staphylococcus epidermidis

<400> 178
cttagggaaa aagatgggta gtaatgttaa agattctaaa attacaccga ataaaaataag 60
tttattttacc gggtcttttag ttactaatga aataactacg atagtacaat ataaaaatat 120
ggagagtatt ttttttcgct ttacaagacg tctaggtata gggtgtttct tagttgctgc 180
aggtgctgat aaaaaggtaa taattaatcc gactaatgcc atagataaaa gaacaaaata 240
gttaatatct aactttatta ttaagtatgg aaagataata aagaaaatta tgttctgaat 300
atgacataac aatgacgaat ttgcatgctg accgtgtgca tgtctcctaa ttaaaaaata 360
acttaaatga gttaaaagtg tgtaaaagaa agtatgaaag attattgcta gcccatcac 420
aactatagac ttttcaatat ttatcgctag tacctgcac cctaaacgaa tttttagaaa 480
ctgtatgtga tctaagttat ttttacg 507

<210> 179
<211> 512
<212> DNA
<213> Staphylococcus epidermidis

<400> 179
cctcgcatat cagtttgtga caccatataa agtaaaataa atgatatgaa aagtactatt 60
gttattatca ataagtatct tttattgagt gacaagtagg atacttttaa tttattgaac 120
aatagttgag ttaaataagc aataattaga gttatgatta caaaagaggt aaaatgtatt 180

aactgtaaag caaatTTaaa cggaatataa tcttttatag tcaaatgtat gtatacagtt 240
 atgaaattag ttatatataa gatcatagtg gtgaataata caactaatat tgaataaagc 300
 tttatttttg tataaaagaa aatggtgatt attataacca aaactattaa tgctttactt 360
 tgccaaaagt aatacattat tgcagaaggg attacaatcg taaaaacgat tatgtaatcc 420
 ctaaaattaa atttcatatt aatgataact ttagtaaccc aaatcattaa aaagatttgt 480
 aggctgcaa acggaaatag attaatatca tc 512

<210> 180
 <211> 534
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 180
 atgaagcaca accaccatac cttgtaaatt ttttttagat ttagttaaaa tggggataca 60
 agatacatcg aaatatTTtag tatgtacggt attaatagca acttctaatt gttcatagat 120
 aactttttca gttctaaaac tttcaataat taatttttca atactatcat ctatgaaacc 180
 aatgtaactt ttattttcta ccatttgatc agggttaaac acctgataat aagcatgatt 240
 agcaactaca atttctccat gtttatcaat catcagtact gaactcggta tattttctaa 300
 ggtagtTTTT aatctattgg attgaatttt ttgactattg ttttaattttt gcaatcgctg 360
 tgctaagtca tttgtagtca caaataatgc ctagtttcc ttcacattac tttctggaac 420
 acgaacatgg taatatccat ctgctagaag tgatgtagca taagttactt cattgatagg 480
 tctaatatat gttcgattga tacttctact tgctaaatag accgtaaata atac 534

<210> 181
 <211> 286
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 181
 ctaagcacia gaaaggctca atattagcta tcataggttt gctaattgta tttgttgta 60
 caggttttat cttcttttca atgatttcag atcaaatatt tttcaaaccat gtcaaaccag 120
 ttgaaaagggt tgaaaaatta gataaaactt tagataaagc atctaaaaag caaatacaca 180
 attatacgag ccaacaagta tctaacaaag caaatacagc ttggcgtgat gcgtctggta 240
 cagaaattaa agaagctatg gatagtagta aattcataga tgatga 286

<210> 182

<211> 381
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 182
acgacgaatg attcataagg tttaatatgg tctaaattta tatcatttaa gtgataatta 60
tgcaatttta tatctacaga tgaaatatct aattcaaaag gtaggttttag ttctgatact 120
tcatttgtga gattggctac aattaatata gtattgtttt taaatgtgcg tgtatatgca 180
aaaacctgct tattttcagc atcgaccata ttaaacttac cgtagatgta aatcaaatca 240
gattttttta gttgaattaa cgctttataa taagaaagta tcgaaaactt atcatttagt 300
tgttgtttaa cattaatttc tgtatagtta gggttttacat gaaaccatgg cttaccagta 360
gtgaatccag cattgataga a 381

<210> 183
<211> 272
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 183
ttaaaccatt aggaaatcgt gtgattattg agaagaaaga gcaagaacaa gcagctaaaa 60
gtggcatcgt tttaacagat agcgctaaag aaaaatcaaa tgaaggtgtg atcattgcag 120
ttggacaagg tcgtttatta gacaatggca cacaagttgc tcctcaagtc agtgaagggtg 180
acacaatcgt cttccaacaa tatgcaggta ctgaagtaaa acgtggcgcc caaacatatt 240
taattttaaa tgaagaagat atattagcta tt 272

<210> 184
<211> 614
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 184
tcaagacacg ctttctagtg ttttatctct agaatatcct gaaaaagaaa ttatcattat 60
caatgatgga agttctgata atactgctga aatcatctat gaattcaaga aaaatcatga 120
ttttaaattt gttgacctcg aagtcaatag aggtaaagct aatgcactca atgagggaat 180
caaacaagca tcttacgaat atgttatgtg cttagatgct gacactgtca ttgatgacga 240
tgcgccctttt tatatgattg aagactttta aaagaatcca aaattaggcg cagttacagg 300
taatccacgt attcgtaata aaagttctat cttaggaaaa atacagacca ttgaatatgc 360
aagtattatt ggttgatatca agcgaagtca atctctagca ggagcaatca atactatttc 420

aggtgttttc acactattta aaaaaagtgc actcaaagat gtaggttatt gggatactga 480
catgattact gaggatatcg ctgtttcatg gaaactccat ctttttgatt acgaaattaa 540
gtacgaacca cgcgcacttt gctggatggt ggtgcctgaa actatagggtg gtttatggaa 600
acaaagggtt cgat 614

<210> 185
<211> 329
<212> DNA
<213> Staphylococcus epidermidis

<400> 185
gttttcttat tacgaaccac attggttcta ccaattttca taatttaaatt ttactttcaa 60
aaaagcaatt agatgaaatg tatgaaacag gcttatggga ctttgaatct catactcatg 120
atttacacgc tcttaagaaa ggcaataaat cgaagttttt agattcgtct caatctgttg 180
ctagtaaaga tattaataaaa agcgaacact atttaataaa aaactaccca aaaaatgaac 240
gcgcacttgc ttaccatac ggattaatta atgacgacaa aataaaaagct atgaaaaaaa 300
atggaattca atatgggttt acacttcag 329

<210> 186
<211> 220
<212> DNA
<213> Staphylococcus epidermidis

<400> 186
ttattctgct atatgatatt cacgaatatt gttatcaata gatttttaaatt agaaaatgtc 60
acgatctgca tttgatTTTT caagttcatg attcaattct aattggtcaa agcgtttgaa 120
gaaatgttca tattcatcaa cagaaacctc tattctatta ttttaataaag atttgtggcg 180
ctcaacatct aattgctcct tgaatccatc tactaatggt 220

<210> 187
<211> 210
<212> DNA
<213> Staphylococcus epidermidis

<400> 187
acattaagtc agcatttggga gaaaacatga ataaatgtct aaaccatatc gcaatgggtt 60
gacgataatc aaattcaggt tgaatcgcat tgggtacaag cgtagaataa caaccatta 120
ttaaaataat caacaaaacg atattcacia atatattctga aaatgaactt aatcgtctaa 180

cgtttttgat ggatagtcgt cttaaagtta 210

<210> 188
<211> 200
<212> DNA
<213> Staphylococcus epidermidis

<400> 188
attagagcca aagtactctc caccgtaacc ttgacttcct tgcgctttat aagtatctaa 60
atatgtttct ttatgggaag aaggcacaac aaaacgatct tcatatttag caatacctag 120
taagcgatac atttcagtca tctgtctttc agtaagtcct aatcgttcta atttagaagt 180
atcgaaaggt tggtttgta 200

<210> 189
<211> 284
<212> DNA
<213> Staphylococcus epidermidis

<400> 189
tttgatacct gtaatttggt cttgccaaagc gggagtatat ttagaagatg cgtcatacata 60
agatgtagct tctagttcgt gttcaaaacg ttgaacacca tattgactcg tcattaaatc 120
ataaaccgta gcaattttta cttcttctcc gttagctaac tgaatagtcc tcgttgcaat 180
aggctcttca aagataccat caccactgct atcaaaatat ggaaattgaa tcgtttcaac 240
atgatagtca ctttcaacca ttgataacat tggatcaatt ggtg 284

<210> 190
<211> 721
<212> DNA
<213> Staphylococcus epidermidis

<400> 190
agctttctgc actacttgac taggatcatt agtgacctct attcctacca ttaaaccctac 60
accacgtact tcaattacat ttcttttatt tactaaactt tttcttaagt tttcaataag 120
aaattgcccc ttgattgaa catcattcag caaatcagca tcattaatga tagaaagcgt 180
ttggtttgca gcagccaatg ataatctatt tccaccgaat gttgtaccat gagaaccgta 240
gccaaatgca tgacctaaat tctttttgcc taacattgct ccaataggaa ggccattacc 300
taatccttta gctaattgtga tgatatctgg agacaattga taatgttcat gagcatataa 360
cttaccggtt ctacctatgc ccgtttgaac ctcgtctaca attataagga tatctttttg 420
tttacaatac tcatttaatt gcttcataaa taaaggatca gcaggtagta ctctgattc 480

accttgaatt atttctataa ttacagcagc agtattatth gaagttaatg atttaaatga 540
 attaaaatca ttaaaaatag caaatttgaa tccaggaaca accggaccaa attgatctgt 600
 aattttcttc tgtcctgttg cagacattgc gccgtacgtt ctgccgtgaa aagacttttt 660
 aaaagcaata atttccgact taccagtagc ttacgtgcg agtttgatag ctgcctcatt 720
 c 721

<210> 191
 <211> 465
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 191
 aaagaaatta agtctctagc caaaatgtat cttggtggta gtactgaaat taaaacatca 60
 caacttaag gtaaggatga ctacttaaat gatataact attaccaccc aagcgtaaaa 120
 agtattatgg aatattcaaa tcttttacgt aatgatttag atttatctca aataacaaac 180
 aaaaacgatt tcttagatca aagagtcatt aaacgatatg gttcactcgt acccttaaca 240
 gaattagatg aagacttatt gcgtaagaac caaaaggaat cgactgatag tcagaaagag 300
 tctgattctt catcacaaaa taatgatgaa gaagatcaaa ctaacgaaca aacagaccaa 360
 aatagcttaa acggaaacga acagtaccca aatcaacaag acaacaatca aaccaatggg 420
 gaaaatggta tgataaataa tgacaattat cttacgcac aataa 465

<210> 192
 <211> 362
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 192
 aaccaaacga tgctagatga ttgctttgaa ataagaaagt gtgttttctg cgaagaacaa 60
 ggcgtaccac tcgaaaatga atttgatcaa tatgaagatt actcattcca tatagtggga 120
 tatataaatg gtgttcctat ggcaactgct agaattagac ctttaaatac tcatatttgt 180
 aaaattgaac gtgtagcaat catcaagtgg tatcgtggtc ttgggtacgg taaaaattta 240
 atacatgcta ttgaaacaat tgcaaaaaaa caccaataca atgaactcac tatgaatgct 300
 caattacaag ctcgagactt ttacttaaaa ctaggttact caccttttgg taaagtattc 360
 tt 362

<210> 193
 <211> 320
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 193
 agttttataa tattcagtgc aaaattcaat tattgcgttt tgaagtggat aatagtattc 60
 ggttggttaa gatagttcat tatataaata aaatttttct ctattagttt tacatttgat 120
 ttgttccttt ttccactggt cttgccattt agattcttct atatttaaaa tttctaaaaa 180
 tagattttct tttgttttaa agtgataata aagattccct ttactacttt ctgataattt 240
 aacaatttct ccagtagtag tggcattata tccatttttt ataaataatt cctttgcgac 300
 acctagtatt ttatctttca 320

<210> 194
 <211> 503
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 194
 tttagagaga cagctagata atttgaaaac atttggcgta gagaaaatat ttacagagaa 60
 acgatcgggg aaatcagtag aaaatagacc tgtatttcaa gaagcactta actttgtgag 120
 aatgggcgat agatttgttg tagaatcgat tgatcgctta ggtcgtaatt atgatgaagt 180
 gattaacaca gttaattatt taaaagataa agagggtcaa ttgatgatta ctagcttacc 240
 tatgatgaat gaagtcattg gcaatccatt attagataaa tttatgaaag acctaatcat 300
 tcaaataatta gcaatggttt cagaacaaga acgaaatgaa agtaaacgta gacaagcaca 360
 aggtattaaa gttgcgaaag aaaatggtgt atataaagga cgccctctat tgtactcacc 420
 taatgctaaa gatcctcaaa aacgcattat ttatcataga gttgtagaaa tgtagaaga 480
 aggtcaagca attagtaaga ttg 503

<210> 195
 <211> 320
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 195
 tgaaagaagg gatagttttg cactttacac aacgtgaaca agacaaattg atgatagttg 60
 tagctgctga ggttgacagt cgtagaaaag caagaggact taaacttaat catcctgaag 120
 cacttgcttt aatcagtgat gaattattag aaggcgcgcg tgatggtaaa acggtagctg 180

aactcatgag ctatggaaaa acaatttttaa acgaggaaga tgtcatggat ggcgtagcta 240
 acatgattac agaacttgaa attgaagcaa cttttccaga tggactaag ttaataacag 300
 tccatcaccc aatcgttttaa 320

<210> 196
 <211> 503
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 196
 atgcaaatta tggagatgaa gctactttcg gtggcgga aa atcaattcgt gatggtatgg 60
 ctcaaaatcc taatgtgaca agagatgata aaaatgtagc cgatttagtt ttaactaacg 120
 cattaattat tgattatgac aagattgtta aagcagatat cggaattaaa aatggttata 180
 tttttaagat cggtaaagct ggaaaccag atataatgga taacgttgac atcatcattg 240
 gtgcaacaac tgatattatt gctgctgaag gtaaaattgt tactgccggc ggtatcgata 300
 cacacgtgca cttcatcaat cctgaacaag ctgaagttgc acttgagagt ggtattacaa 360
 cgcataatcg tggaggaact ggtgcttctg aaggtgctaa agcgactact gtaacaccag 420
 gaccttgga tattcatcgc atgttagaag cagcagaaga gatgcctatt aatgtaggat 480
 ttactggtaa aggtcaagct gtc 503

<210> 197
 <211> 452
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 197
 tgattataga agaaattcaa ggaaatattg ctaatttatc tcaagatgaa aagcaaaaac 60
 atgtcgaaaa agtttatctt gaaaactcag atttggttaa acgtatacaa cgtgttaaaa 120
 cagatcacgg taatgaaata gggatacgtc ttaaacaacc tattgaccta caatatggtg 180
 atattttata tcaagacgat acaaacatga ttattgtcga tgttaatagc gaagacttat 240
 tagttattaa acctagaaat ttaaaggaaa tgggagacat tgctcatcaa ctaggtaatc 300
 gccatctgcc tgcccaattt acagaaactg aaatgcttat tcaatatgac tatcttgttg 360
 aagatttatt aaaagagttg ggtatcccct actcacatga agacagaaag gtcaatcaag 420
 catttcgaca tataggacat tcacatgatt ga 452

<210> 198

<211> 524
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 198
ttaacttatt cagatgggat agctatgaga attgtctacc acgcattaat taacaatgac 60
aaagataaaa ttttagatat taaccaaaaa ctcttcgtac aaaatctacc taaagaaacg 120
cgtattggcg ctaagcaaat gggtagacgc atggtaaaat tagctttaga tctttatgat 180
agtgaatgga ttcaatggta ttataatcaa atgaaaaaca ataaaattaa gcttcacact 240
gctgtgtgct ttactatgct aggacatddd ttaggtgtag atgtggaatc catcattgat 300
tattatddd atcaaaatat ctctagcctt acccaaaatg cagtaagagc gattccttta 360
ggacaaacag ctggacagca agtcgtaact gaaatgatag cccatattga gaagacacga 420
aatcacatac tagaattgga cgaaatcgat tttggtatga ctgctcccg cttggaactt 480
aatcaaatgg aacatgaaaa tggtcatggt cgaatcttta tttc 524

<210> 199
<211> 500
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 199
tcgtatatgg aatttgtagc agatcctatt attgcctatg aaaacgctaa atttttccaa 60
cataatacgt ttaatcttaa agaagatagt gctatgtttt aactgatat attgactcca 120
ggctattcat ctaatggcca agatttcacg tataattata tgcactttat taatgaaatt 180
tacattgaca atcaattagt tgttttcgat aacatgatgt taagtcctga taaaagcaga 240
cttgacggca ttgggtatat ggaaaattat acacacttag gatcagctta ttttattcat 300
ccagatgtaa accaaagttt catagacgat atttacgagg cggttgctga ttttcaaaaa 360
caatacgact gtagaatagg tatctcacia ttacctactc atggattggc cgttcgtatt 420
ttgactaaaa gaactcaa atagaagaa attttgactc gtgttcaatc atatatcaat 480
caaacgattt atcatcgaca 500

<210> 200
<211> 363
<212> DNA
<213> *Staphylococcus epidermidis*

<400> 200
gcttaacaac gtaaaacaag ctggcggtga tcaaattgta actattattg gtcattggcg 60

tgagagtgtg aaagatacat tgggtaatca atcattatat agttttcagg ataaacaact 120
 tggaacagct catgctgtga aaatggcaca tgaacattta gcagataaag aaggaactac 180
 tctagtagta tgtggagata caccacttat tacataccaa actttacaat cacttattga 240
 acatcatgaa agtacacaat cacatgttac tgtattatct gcttctacta tcaatcctta 300
 tggttatgga cgaattatta gaaatcataa tggaatatta gagcgtattg ttgaagagaa 360
 aga 363

<210> 201
 <211> 780
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 201
 agctcacggc tttaactatg ctatttataa agatgtgggt ttagatttct gaaaactgga 60
 atatattctc tttgttgatc tactaagtct acatcgatat gtgttggttag tactccttct 120
 ttatcatcta aatgggtctaa aatttcacca ttaggattaa tgacaattga atttccagca 180
 taattggtgt gaccatcatc accacaacta ttacaagcta caataaaaat atcattttcg 240
 attgctctcg ctttttagtaa tgataaccaa tgatctagtc ttgagctagg cactgcgct 300
 acataaaaag caatttttagc accttttcta gctggatagc gcaatatctc tggaaatcgc 360
 aagtcataac aaatgatttg cgtcacaaagt gtttgatcag ataaataaaa aggttcaggg 420
 actacatttc caccacataa aaagtctggc tcacgtaaca ttggcacgag atgtactttg 480
 tcatattcat taatcaattc tttgttttta ttaattgcaa aagcagtatt atatatatgg 540
 ttttctotta tatttgacac tgaacctgca atgatatcta cattaaatgt atgtgctaag 600
 tcttttataa agagagagct gtctttaaga tttttatcag ctttttggtc taattcttct 660
 aatgcataac cgttattcca catttctgga agcacgacga cactggtatc tttatctaag 720
 tattgattaa acttagtttt gatattttgc atatttttat caacatttcc acgttctaca 780

<210> 202
 <211> 501
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 202
 gtatttacgt gcgtttatgt gtgtcataat catcgtgaca cacttactaa cgcaaatcac 60
 tttagaaaat gaacagatgt ctgatagttc actcatattg caatattata tacgcaatat 120

tttttattttc ggcaccccta gttttataat attgtctcaa ttattaacaa cattaaatta 180
 cgaatcagta actataaatt atcttttttc aagattttaag tatattttta ttccatatct 240
 tttaatcggc ttgttctata gttatagtga atcacttata accgcttctt cttttaaaaa 300
 gcagtttata gaaaatgttg ttttaggaca atggatggc tatttcatta tcataattat 360
 gcagttcttt gttctatctt atatcattta caaaattaat tttagattgt tcaatagtaa 420
 aattttgctg ctttttagcat ttatagtcca acaatcttat ctacattatt ttttgaataa 480
 tgacactttt catcaattca t 501

<210> 203
 <211> 300
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 203
 ggtcaagccc agacagaggc aatatccaac ggtaacctct tatttaaata tagttaggga 60
 gagcttattt attactatat ccggagtatt ttggatgtat tgtatcgttg tgatgattgt 120
 ttatatagga actcttatca atttctcaat ggaaagtgtt ataacaatac gtattgcatt 180
 aaatgttgaa aacacggaaa tttacaaatt attcggatgg atgagtttgt ttgtacttat 240
 tatattttatc ttttttacat ttagtctcgc gtttcaaaaa tataagaaag gtcgtgacat 300

<210> 204
 <211> 406
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 204
 catttaacag tgaatatact tggcttttaa aacggttttt actgtcctca ataacccga 60
 atttttgtga aaaggaggct ctaaaatacc aagtctcaag aaaaagaaga attaagttta 120
 taaagtcttc tttattcaaa gcgatgtgcg taggatcata atactttatc aattcatcat 180
 gtaaggtagt attaatttct tgaagatggg gtttgatttc tgaattcagt gcttctggag 240
 cactagataa ttgaacatat aatttaatat atctctcatc aacgtcgaat ataaatttga 300
 ataaaaactg gtaaagtccg tcaatggaat aattatcgtc atggttccta agcaaaaaat 360
 ctataaagta attgaaacaa ttctcaacac tttttcgata tatttc 406

<210> 205
 <211> 325

<212> DNA
 <213> Staphylococcus epidermidis

<400> 205
 atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga tcaagattgg 60
 actaaattag gaactagtat cgttgacatc gtagaaagtg gcgttagcgt attaggtaaa 120
 atcttcggat tttaattaat cttagttttt taaaatataa atttaaataa ttaattaggg 180
 agagataaac atgtcaaaat tagcagaagc tattgcaa at acagtaaaag cagcacaaga 240
 ccaagattgg actaaattag gaactagtat cgttgatata gtagaaagtg gcgttagcgt 300
 attaggtaaa atcttcgggt tctaa 325

<210> 206
 <211> 451
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 206
 tgacacaata cctcatgaac caccacaata agttgatacc ctcacttat tttgtaaaga 60
 aatttaaaca agcaaaatcg tcaattagtg aagacgttca aatcattaaa aatacgtttc 120
 aaaatgaaaa attaggaact attattacta cagcaggtgc tagcgttgga gtaacctata 180
 agcctatgat gagtaaatca gaggccacag aggttggtga tgaggtgata gagcaattac 240
 aagagaaaga ccgtttgcta cctggaggat atttatTTTT atccgattta gttggtaatc 300
 cttctctatt aaataaagta ggtaagttaa ttgctagtat atatatgaac gaagaacttg 360
 atgctgttgt taccatagcg actaaaggga tatcacttgc gaatgcagtc gcaaacgtat 420
 taaatttacc ttagtggtt ataagaaagg a 451

<210> 207
 <211> 300
 <212> DNA
 <213> Staphylococcus epidermidis

<400> 207
 gtgacagatg taagacttag aaaaatacaa acagacggca gaatgaaagc actcgtttcc 60
 attacgctag atgaagcttt tgtaattcat gatttacgtg taattgaagg aaactcaggt 120
 cttttcgtcg caatgccaag taaacgtaca ccagatgggtg aattccgtga catcgcgcat 180
 cctatcaatt ctgatatgag acaagaaatc caagatgcag tgatgaaagt atatgatgaa 240
 actgatgaag ttattccaga caaaaatgct acttcagata acgaagaatc agacgaagct 300

<210> 208
 <211> 380
 <212> DNA
 <213> *Staphylococcus epidermidis*

<400> 208
 atgaaaataa tcaactcaga taaggtaccc gaagcactag gcccatattc gcatgcaact 60
 gttataaacg gttttgtcct tacatcaggt caaattccac tcacacttga tggaacaatt 120
 gttagcgatg atgttcaaga acaactaag caagtttttag aaaatttaac tgtggtatta 180
 aaagaagcag attctgattt gaattctgtt gttaaagcga caatctatat ttctgatatg 240
 aatgattttc aacaaattaa tcaaatctat ggaaactatt tcgtcgaaca ccaaccagct 300
 cgtagtgtg ttgaagtgtc acggttgct aaagacgtaa aggtagaaat tgaattgata 360
 ggtaaagtga aggaattata 380

<210> 209
 <211> 245
 <212> DNA
 <213> *Staphylococcus haemolyticus*

<400> 209
 atgaacatga gcgacatcat ctttcttaat ggcatgcgtt tttatggcta tcatggagcg 60
 cttcatgcag aaaatgaact tggccaaatt tttatagtag atgtaacact taaagttgat 120
 ttgactgaag cagggaaaac ggataatgtc aaagacactg tgcattatgg tgaggtcttt 180
 gaagatgtta aaaacattgt tgaagggcc a tcttgtcaat tgatagaaca tcttgcagaa 240
 cgtat 245

<210> 210
 <211> 563
 <212> DNA
 <213> *Staphylococcus haemolyticus*

<400> 210
 ttgaattggg aacgacagct ttgaaagggt caatcgattc agcaaattatt gatcctaata 60
 taatacaaca agttattttc ggtaatgtgc taaaaagtg tgtaggacaa aaccagcac 120
 gtcaaattgc gattaaagcg ggtgtacctg atacaacacc agctatgaca attaatgagg 180
 tatgtggatc aggtcttaaa gcaattatat tagggaaaca gtttaattcaa ttaggtgaag 240
 cggtgtagt agcagtgggt ggagttgaaa gtatgacaaa tgccccacaa ttaatcttaa 300
 aagaagggtca agaaccagtg gaaagcttta tgcattgatg tttaacagat gcctttcatt 360

atgtaccaat ggggtgtaaca gctgagaaca tagctgaaaa atatgacatc acgctgtaaa 420
 tgcaagatga gttcgcaaat cattcacaag ctaaagcagc taaagcgacg caagatggta 480
 aatttaataa tgaaatcatc ggtatgactg acgcagaagg ggaacaaatg acttctgatg 540
 aaggtgttcg cccaaatagt agt 563

<210> 211
 <211> 231
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 211
 aatgacgatg aaacttcctt tgcacaccgt gttgaagcgg atggctggga aaatgaattg 60
 gctatggttt ttgttggtat taataacaaa tctaaaaagg tatccagtcg ttcaggcatg 120
 tcacttacac gtgatacatc acgtttttat caatattggt tagataacgt tgaaccagat 180
 ttgaaagaga ctaaagaagc cattgctcaa aaagatttca agcgtatggg t 231

<210> 212
 <211> 278
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 212
 catcaattgt gtgataatga taagaattat atgcaagttg ttaaacadat tggttcttta 60
 gtgtattcag ctagtgaagc gattgagcat catagttttg atcaattagc tacaatcttt 120
 aatcaatgtc aagatgactt aagaacattg acggtgagtc acgacaaaat agaaatgttt 180
 cttcgcttag gagaagagaa tggttcagtc gctggcaa ataacaggtg cggccgtggt 240
 ggtagtatgc ttatcttagc taaagaattg caaacagc 278

<210> 213
 <211> 200
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 213
 acgtatatcg tcctgaatat tttctaagta gtaaataagac ttatcgatc cagtttggtc 60
 agtagcgtga tcgaattcta aatcatcgaa tcgcttgaag aaactttcat agtcttcaac 120
 tgaaacttct tgacgttcat tcaataaggc tttatgtcct tcaatatcta attgtttttc 180
 atagccttcg actagcgtag 200

<210> 214
 <211> 565
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 214
 aatcgccac ttgtcttttg aaaatgactt catataaact ttgcctaact taatttgaaa 60
 ggtaagggtt atggcgcatc aatttatata actagagaag acctttaag cattccaaaa 120
 tagtcgtagt agtcacgaac aagatagatt atttatagat atagtaaacc acatacaacc 180
 taaacttttt ataaaattta aaagttatgg aatacaaaat gaagatattg aagatttagt 240
 acaagaaaact ttaatcagga tttatttagc acttcataca tttgatttta gtacagacgt 300
 tccttttgaa cactatttga attgtatcgt acgatcgatg cgaaatgatt tttggagaag 360
 aaaatatatt gagactgata agtacgatag catcattaat gactatgtta ttgactacaa 420
 attgaatcaa tcaagtaa atattgaaga ttttgtatg ataaaagaga aacgagaatt 480
 gctagcgagt agtttaacag tattaagtcg attcgagcga aacgtagctg aattactaat 540
 gtctgattat acgcctagtg aaatt 565

<210> 215
 <211> 635
 <212> DNA
 <213> Staphylococcus haemolyticus

<400> 215
 ccaagatgct aatgtgtctt caaaagaatc ggaaatcgac aaaaatatta ataaagtaga 60
 cgacgcgcag tcttattctc aacaaaatga gcaacaatcc tcaaaagccg aaaataagga 120
 aatacagaat tcaacacaag cagaacaagt tgaaaaacag gaacaacctg cttctaataca 180
 gacggcta at cactcttcaa aagagtcctc cattaataat caggaaagtc ataacaaca 240
 gcaacctagt gatgacaaaa cacctaatat caaaccagaa aaaattgaaa aagtagataa 300
 tcataagcgt attcaagatc agtatcaaga taaaaacaag caggttgata ataataatc 360
 taacaattcg caattaaacc aaaaagaaca tcccaattca tcaaataata aacaacaaaa 420
 gcaacgtcta gatgttaa ac caaaaacga taaccaacaa ttacaatctc gaaatgatgt 480
 aaaagaaaaa ttagataacc agccaattga gcaaaaagat accaagctgc aaagtaacaa 540
 taaaagcaaa gacaacacaa cttctgtaaa gtcacacagc caacaacata aaccgcattc 600
 attaaagacc caatcccatt taactccagg tcaaa 635

<210> 216
 <211> 468
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 216
 tgcgaattaa acagttaggc attaatgac aaatgaattg cgtaaaattg tataatgata 60
 ccaaggagcg tgacgctaatt ttgaaggcga tagacaaaaa aattgaaaga tttgctagat 120
 acttgacgagc tcaaaaacaat ctagaccata ttcaattttt gaagatacgc ctaggcttac 180
 aagtcgcatt aggtaatttt ttcaaaacta ttgttactta tgggtgttgc cttttattcc 240
 atacctttct ttacacatta attacacact taacgtatct tttcgttaga cgttttgagc 300
 atggtgcaca cgcaaggcca tcattgttgt gccacattca aaatttaggt ttatttgtgg 360
 cattaccttg gtcaattgtg cattttcaag tgtcttgagc attcatgatt tttgtagcat 420
 ttatcgcatc cataattatt atatgttacg caccatcggc aactaaaa 468

<210> 217
 <211> 450
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 217
 tttaattgtg ttatttgttg ctaaaatagt agccgatatt aaatttcaa tgagggatta 60
 ttttgccatt tttggtatca taatcccttc aactatactg tttggcgtga taggtagaca 120
 gtctttaata tttttgataa ttggatgttt aatattcttt tatttgaaaa taggcttata 180
 ttccgtttta gcaatctttg gttctgcgct tattatgtat gttagtaatt atatttctgt 240
 catccttagt gtaattgctg attatttttc tttaagttat atagttcaa taataataat 300
 attagtttgc tttactctaa tatcaataat ttgtgcttat ttcattaggt ttctattaat 360
 aagctcaaaa aaaacctatc tgtatttcaa caaaatatac atatcagtaa tatctatttt 420
 ccttatttta tctttgatca tgctctatct 450

<210> 218
 <211> 466
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 218
 tatcaatctt tcaagcagtt atgttaataa ttgtagctaa aattattgca aacgttaagt 60
 tttacttaag ggattattta gccgttgccg gcataatagt cccttctgcc gtattatttg 120

ttgttttttg cagacaatca attatctttt tacttattat ttgtttaata tactttttatg 180
 taaaaatagg gttttattct ataatcgcta tattaggctc tgccttaata atgtacataa 240
 gtaacttttt ctcagtttca ctcataatat taataggtaa ttttatcaaa tttaggataa 300
 tatacgtaat aatttcttta tcatcataca tactgatagg tgttttatgt gcatttatga 360
 caaaatactt aattaataaa ctcaaaaaaa catacttatt ttttaataaa gtatacataa 420
 tcgtcatatc tactttttta acatttacca tcgctatatt ttattt 466

<210> 219
 <211> 512
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 219
 caaaggagtg tgattttatg tcaaaaatgt tagttctttt ttctacatgt attcttttaa 60
 tgtcgatgtc gttaattttt atgcctgtta gtcatgcgca aggtttatcc tctaagcaag 120
 caacgttgta tcagcagaat ccaaaagata ctaatactca agtttcagga aaactgaata 180
 attcgaaga aacaaaagca aatgatacag caaccttatt tgcaaaactct aaagtcaatc 240
 aatatattat cgacaatcat cttcagcatt cgccagtagt aaaagatcca cgtatggata 300
 cacttcctaa attagaatat aaaaacggca cttacatggg tgttggtatt cacgaagtgg 360
 gcgaagacaa tcgtccttta caagtatggg tagatcgcat gtatgaaact tatactagag 420
 catttgta cgcattcggt gataataacg aaatacatct tactgcacct gcagaatatt 480
 atgtgtgggg agctggtcct aaagctaadc ca 512

<210> 220
 <211> 646
 <212> DNA
 <213> *Staphylococcus lugdunensis*

<400> 220
 gaagtggagc gtaatttgct aaaacaacaa atacagcata ataatgatgc tactggtgac 60
 actcaagatg ataataatta taataatgaa atatcaaatc aggaagcaac aacgcagaac 120
 aaacaaataa ctcagtctga caatgtaaat agcgaggcac aagcaataaa tgaaataagc 180
 gacagccatc gtacagtaaa taaagccact gaagcactag acaataactc tactttaaat 240
 acatccaccg atgtatcacc tgcaacgaaa caagatacaa ctactagcaa tcaaacaact 300
 caggaaaaca atgatgcaac aacacaaacc aaaacaaatt ataagcaaga tggtataaac 360

aacgtattat cccaagtagc aaccaatgac aatcagtcctt caaatcaacc acgtaacagt 420
cacctaaata catccacagt aacatacaac aataatcatc aagtaagaag attagcaaaa 480
gttgaagcaa caaatacaga taataacggt actcagactt cagacatatc gaataaactc 540
tcaaattgaa cagcgacaat tgaagcggca gatacgattt acccacataa agcagaatat 600
gtaaatttaa attatcggtt ccaagcccca gatgatgttc aagcag 646

<210> 221
<211> 500
<212> DNA
<213> *Staphylococcus lugdunensis*

<400> 221
tgtcaggtat cgtagatgca attactaaag cagtacaagc aggttttagat aaagattggg 60
ctacaatggc tacaagcatt gctgatgcaa tcgctaaagg tgtagacttt atcgctggtt 120
tctttaacta aaatataaat tgagacttta acaataatcg taaaaaggag cgttttacaat 180
atgtcaggta tcattgaagc aattactaaa gcagtacaag caggtttaga taaagattgg 240
gctacaatgg gcaactagcat tgcagaagca cttgctaaag gcattgacgc aatttcaggc 300
ttatttggtt aatctcaaat ataataaata atactattta aaataaaaaat attttttaaag 360
gagcgaacat atcatggacg gaatttttga agcaatttct aaagcagtac aagcaggttt 420
agacaaagac tgggctacaa tgggtactag cattgcagaa gcacttgcta aagggttaga 480
ctttattatt ggattattcc 500

<210> 222
<211> 500
<212> DNA
<213> *Staphylococcus saprophyticus*

<400> 222
gaaataaaccg cattccaact aacactttaa ttaatggaga aaagagaacc aaaccaatcg 60
atgtgcctga aattttttaa gtcttaagct caatgattcg tagacgttta tatcattttg 120
ctatacatcc aaatgaccaa gaagatttgt gtcaagatgt gctcgttaaga ttatactgtg 180
catttaaaaa atttgatttc actgatgaca cacctattga gcattatgta aatcgtgtga 240
ttaaaaaatgt aaaaaatgat tatatccgta aaaaatgcta tggcaacca cgacaagaaa 300
tgctgggtcaa tgaatttata gtcaatgatc aaaatagtaa aacagaacac ccacttgata 360
aacatatatt agcttttagag ataggaagtc aattacaaca gggattaatg aaactgacgg 420

tcttagaaaa aagtatcgta atctatttac taaatgactt taagccgaaa gaaattgctg 480
 aaacactaaa tatacaaatac 500

<210> 223
 <211> 432
 <212> DNA
 <213> Staphylococcus saprophyticus

<400> 223
 aagagaacca aaccaatcga tgtgcctgaa atttttaaag tcttaagctc aatgattcgt 60
 agacgtttat atcattttgc tatacatcca aatgaccaag aagatttgtg tcaagatgtg 120
 ctcgtaagat tatactgtgc atttaaaaaa tttgatttca ctgatgacac acctattgag 180
 cattatgtaa atcgtgtgat taaaaatgta aaaaatgatt atatccgtaa aaaatgctat 240
 ggcaaccaac gacaagaaat gctggtcaat gaatttatag tcaatgatca aaatagtaaa 300
 acagaacacc cacttgataa acatatatta gctttagaga taggaagtca attacaacag 360
 ggattaatga aactgacggt cttagaaaaa agtatcgtaa tctatttact aaatgacttt 420
 aagccgaaag aa 432

<210> 224
 <211> 200
 <212> DNA
 <213> Staphylococcus warneri

<400> 224
 aaaagatatg acataatggt acgaatagtt aaactatccg gatcaaatgt taactttaca 60
 cattcagcat aaccatcgta ttcaccattc aaattcgatg ttattccatt agcccttcca 120
 gcttcagttg atacgatacc tggatatagtt ttaaaaaaag cttgaacgcc ccacaaacaa 180
 ccgccagcta catatactat 200

<210> 225
 <211> 515
 <212> DNA
 <213> Staphylococcus warneri

<400> 225
 catccaattt acagaaccat ctttttcatc tatgactgca ttattaatta taatgcttac 60
 taaattgtcg attgcatcgt caatattgtc tgaatttact atttcatatc cataatttat 120
 aaatccatta ccatcaataa ataatttatt ttgactttct aatgaaaatt ttattagttt 180

acattgaaac aacaaatctt tcaaagaata tctttgcgtt ttttctaaaa atacattgag 240
 tgggtttttc aataagtgat gtaccgtatt atttttaata tcttttaccg aaacactttg 300
 gaccttagta taaaaatagg gtactgaaag agtttctatt tgttttattt ctgaatttat 360
 taacttatca cttaataaat ttccaccgta ctcttctagt ttgttaaaca agctctttcg 420
 cttatttgca taaagagggtg atttagcagc ttgtattaat actgagtact caattgtact 480
 tcttggtaaa attctcactt ctacttctga tgacg 515

<210> 226
 <211> 320
 <212> DNA
 <213> Staphylococcus warneri

<400> 226
 tgtatcaact ccacttttatt catattaatg acgacgcact tacactcaca aagtcaaagc 60
 aagacaccat tcacttattt ataggcaatt ggattaaccc atcagcccaa aaatctatta 120
 gcattcgaac tggcggtgat acgaatcaca atcaatatca aattcttcaa attgataccg 180
 aacatcaacg tattaactg acttctgaag aagatcctca actcatgtat attttagact 240
 acgaagatac aaaccatata ttcatacaaa catcagttaa gaattcgtat ggcacgtcaa 300
 gacccataag atacgaaaaa 320

<210> 227
 <211> 271
 <212> DNA
 <213> Staphylococcus warneri

<400> 227
 agcaagttct ttgttaattg caactttgac atcagcgaca ttaattaato cggcacatgc 60
 agaaacgaca tcatcaaccg ataataacca acaaaccaca caatctcaac aacaaaagac 120
 accgaagatt gataaaggta ataacgtcaa acctgttgaa aagaaagaac gcgcaaattgt 180
 catactacct aacaatgatc gacatcaaat taatgatata acgttaggtc actatgctcc 240
 tgttactttc gttcaagttc aatcaaacga a 271

<210> 228
 <211> 500
 <212> DNA
 <213> Staphylococcus warneri

<400> 228
 tattgtcaaa gtcacaacaa ttagatatag aattaaagc gatacttcaa caattcaatt 60

cttttattat gagaagaatt aattatattt ctcaaatga ttttgaaaaa gacgaccttt 120
 atcaagaagt gctcatcaaa atatatctag cgcttgagcg ccatcatttt caatatgatg 180
 attcgtttat aaaatatata tcgcggtca tcaaatcagt taaatgtgat tactatcgac 240
 ggcattacac tcaacagaag cgatatatga atgtagttaa tgatgctgtg gttgaatatc 300
 aaacgaacct gcttaataga gatcgagttg aaagagaaat attaacatgt gaagcaatca 360
 aactattgaa cgcggtgtgt gagaaattaa ctaaacaaga acgagaagta tttgaatttt 420
 atagtaaagg ttataaacca aaagaaatcg cacatttact aggtataaaa gacaaagtag 480
 ttacaatgc gatacaacgt 500

<210> 229
 <211> 400
 <212> DNA
 <213> *Staphylococcus warneri*

<400> 229
 tcagatataa acaatttaac aaggatgtta tcaactgtagc ggttggttac tatctaagat 60
 atgcattgag ttatctgat atatctgaaa tattaaggga acgtggtgta aacgttcac 120
 attcaacggt ctaccgttgg gttcaagaat atgctcccg tttgtatcaa atttggaaga 180
 aaaaacataa aaaagcgtat tataagtggc gtgttgatga gacatatatc aaaattaaag 240
 gacagtgggt ttatctgtat cgcgcgattg atgcagatgg acatacatga gatatttggt 300
 tgcgtaagca acgagataat cattcagcat atgcgtttat caaacgtctc attaaacaat 360
 ttggtaaacc tcaaaaggta attacagatc aggcaccttc 400

<210> 230
 <211> 758
 <212> DNA
 <213> *Staphylococcus warneri*

<400> 230
 taatcaaacg caacaacaac cttcagaacc aacaaaagcg aaagattctg atacaaataa 60
 tacgaatgtt gaacgtcctg aatcgaattc gacacaaaca tcaaatcaag aactgacaa 120
 aatgcaggat acatcaacta atcaaacaaa cgaaaattct aaacatatta ttgataaaac 180
 taatgacgtt tcacatgaaa ctacaaagac aaatgataga gatcaaacgt catctcaaga 240
 caattcagaa caatctcttg aagtcgactc aaatgaggca ccagcttcaa atgacaaatc 300
 aactccaacc aaacaagaac ctactaattc aaagcaagat attgatgaaa catctaaacc 360

taatgaagat tcaaaacttg taccatcaaa gtcaaataa acatctaaag cagataaaca 420
 agaacagtct tctaaagaac ctgttgagga taatgctcaa aaagataaac atgtatcaca 480
 agaagattca tctttagaaa agcaaggtac acaagaggtc ccgcagactg acacacataa 540
 agatgtcaat gtaacacctt caaagtcac atcagaacaa caactatcta caacacaaca 600
 cattacagct aaagattcta gtgcttcaca agagggtgcc gttcattcac tagattcatc 660
 taaacaagat cacacaacat cgactgagag ccatatcaat ttagataacc tagataaaca 720
 agcgactaaa gatcgtacac ctacagataa tggcgatg 758

<210> 231
 <211> 562
 <212> DNA
 <213> Candida albicans

<400> 231
 aaacgcattg ttaagagacc cagaaatcaa aactggtaaa gtgtctgttg cttcatactt 60
 gaagtttttg gattctgttc aattcaagag ttatggagac gaaccttttg aagtattggc 120
 tattgtggtta gaacaaaatg acaaaattcc taaattagac gagtttttgt catccaagac 180
 aggttggtta aacaatgtta ccgataatat tttcaatgct atcaagaaag attacagtca 240
 attatgttgg gttgttaatg aaaacgatgc caacttacct tggatattct ccaaatacaga 300
 tggttcatth gccaaagaatg gccaaatctt gttttgttac ggtttaaaca ttgacgaagc 360
 tagtaaattg attaaagaat ttgattcttc atctattgga tcatcgttgt catcttctaa 420
 agaatctggc gtattcacat ctgctcaaca aaagcgtggg ttccaccact ctacagtccg 480
 tagaaacacc aatcctaate ctccattatc tgaaggttaag caaaccgaga gaaaaaaagt 540
 tgctttgatt ggtgctagag gt 562

<210> 232
 <211> 524
 <212> DNA
 <213> Candida albicans

<400> 232
 caggtaagtc aaagtctggg gagttatctt ctactgggtc tgtgacaact aatacagcaa 60
 caccagatgt tccatcaact aaagtacctt cgaatccagg ggcaccaggg actggtgttc 120
 caccaccttt agcaccatcg acagaaacac aaactaccaa taatgtacca ggctcaccaa 180
 atatccctgc cactggaaca actgatatta ttagagaatc aactactggt tcacacacag 240

tgaccgggaa tggaaatact ggcgttccaa tgaatccaaa ccctgcgttg acaacaggca	300
cttcactgac tggcgcaacg aattctgcaa ctaacccatc tcatgaaaca ggtgttaata	360
caggatcagg aggtcgaact aatattgtca ctccaccttc ttctgcaact gcgacagtgg	420
ttattccagg aactgataat ggtgctacta ccaagggcca agatacagct ggtggcggca	480
actctaattg atctactgct accaccaata tacaagggtg caat	524

<210> 233
 <211> 230
 <212> DNA
 <213> *Candida albicans*

<400> 233	
gattaatgac atcaagggtt tagttaaagg cattaaaggc aaaaacggga aatcctactc	60
aagtgtccca gttgggactg ttgattcttg ggatgtctta gttgatggtg ccagtaaacc	120
agccatcgat gctgcagatg ttgtctactc caactccttc tcatactggc aaaaaaacag	180
tcaagctaatt gcttcatact ctcttttcga tgatgttatg caagctttgc	230

<210> 234
 <211> 632
 <212> DNA
 <213> *Candida albicans*

<400> 234	
tctggtgaag gtttaggaag aaagaaatca ttaattagac cagaaagatc aagaatggat	60
gaaagccatc cacgattcca ttatactcaa gttgcaaata aagaatctaa tcatattaaa	120
gtacagccat cttcaactgg tgttgatcct cgtaaatcaa atgaattatc aacatcaaga	180
tcacatttga gtaattacgc tactccacca catcaagagg aagaagaaga cgaagggatc	240
cctttaatgg atatacacia tgcttcaccc aatggttagca gtgacaaaaa taatgatcta	300
aaaggtggac gtgaagttta tggattaaat gatgaaatca acgattatgg tagttcaccc	360
aagaaaaacc aagtcatttc atcttcaaga ccaatgaaca acgaaaaacc agctaaacct	420
aaacatgata tatattttctg gaaagtttat tgttatgcta ttacattttg ggcaccagct	480
ccattattga aattattttg attaccaaca aaagatcgtc aattcgcttg gagagaaaaa	540
atagggttga tttcttgtat tctttacgtt ggggcatttg ttgcttattt gacttttggt	600
ttcactaaaa ctgtttgttc gagtcaagtg gt	632

<210> 235
 <211> 633
 <212> DNA
 <213> *Candida albicans*

<400> 235
 caccaaactc aggcttattc aaacaaggat actcctcctt ctccaatgcc gacggagcca 60
 ttatcagaaa tgttgaagca gttcgtgaaa tcgcctctat cttactcacc tccatgggtc 120
 caagtgaag aaacaagatc atcgtcaaca agttgggcaa aaaattcatc accaacgatg 180
 ccgccaccat gcttaacgaa ttggaaattg tccaccccg agtgaaaatc ttgatccagg 240
 catcaaagca gcaggaattc gaaatgggag acaacactaa cctagtaatc atccttgctg 300
 gcgagttcct caacgttgct gaaaaattgt taacattggg cttgaatgtc agtgaaatca 360
 tccaggggtt caacttgga aacaagtttg tgatgaaaac attggacgag ttggtcgttg 420
 aaaaagtcga gtcgttcgaa actgacctat taaaagcagt gaagccagtg atcgccgcta 480
 aacagtacgg cgtagaagat accatcgcca aactcgtcgt tgatgccgtt gccctagtta 540
 tgaagaacgg gtctttcaat gtcgacaaca taagagtggg caaggtcatg ggtgcatcgc 600
 tctcccaatc gcaagtggc aagggtatgg tct 633

<210> 236
 <211> 465
 <212> DNA
 <213> *Candida albicans*

<400> 236
 gaatgcaaag aaacattgaa atcaagagta ttttgatcca attgaccatg tatgctaagc 60
 ttaacgaaag ggtcgactat ttgttggaag agttaacatc cactgaatta ttggatagtg 120
 aaaaagtcag gtcaaagttg aattcagaat ttgatcctca agaaaaattc gattatgata 180
 aattgattaa agacaagggt ctgaccttga gaaaaggatt gaaagatttg aaattcgata 240
 gagaagagat tgaaaatact ccttgctata atgaaatgat tgaagatttg tttgttcaaa 300
 tcaaggatga tcatccagag acaaaaaccg atggcgacaa attgattgaa tacttaaaag 360
 aacatagaaa caggatcgac gatgttttgt ctaaacagac tataaaattg gatgatttat 420
 tgtaccagaa agctcaattg atagtaagtg atgatttgca tacgg 465

<210> 237
 <211> 504
 <212> DNA
 <213> *Candida albicans*

<400> 237
 tgtctgctgc tagtgaatcc aaatattcta ctgaagtgc ttccgaatta ttgagcaaat 60
 tacaagttgc tgataataag gatgaagctg cttccaacat ttccactttt ttaaactcat 120
 ctattgttga acacgatgtt ccagttgaat ttttcgaaga ttgaaaaaa caaattcaat 180
 ctaaagatgc taaagtttct cttgctgctt tggatgctta caaacacatt gcttcaacca 240
 acggtttatc cccatccgtt gaaccatatg ttgttgactt ggtagtgaa gttgccgtta 300
 aagctggtga caaaaacaag gatgttcaaa ctgctgcttc tgatgcttta ttggccattg 360
 cttctgccat caccccaact gctgtcaaag ccatcttacc aaaattgatt gacaacttga 420
 ccaacaccaa caaatggact gaaaaagttg ccatcttgag agctgtttct caattgggtg 480
 aactgctaa agtcaaatt gctt 504

<210> 238
 <211> 526
 <212> DNA
 <213> *Candida albicans*

<400> 238
 tgacaggttc attggtgtct taaaaagtc ttggtaaaaa aggtggattt tggattttca 60
 cattattcaa ttatctctgt atcgggtgtt tgacatcttt gttcattgtc tccattggta 120
 atagaccaca tgcataaag aatattttca aaacattaat catattgtta accatatgtg 180
 cattatacgc attggtgggt ggatttgtgt ttgttatcaa tactattgct acttttggaa 240
 ccggtggaac atctacctat gtgctcgta gtattgtggt ttcatgttg tccacctatg 300
 gtctttatac gttaatgtcc atttgtact tggacctatg gcacatgttg actgtttctg 360
 tacaatactt ttgatgatt ccatcgtaca cttgtacatt acaaatattt gcattttgta 420
 atactcacga tgtctcgtgg ggtacaaaag gtgacaacaa tccaaaagaa gatttgagta 480
 atcagtacat tattgagaaa aatgccagtg gagaatttga ggctgt 526

<210> 239
 <211> 621
 <212> DNA
 <213> *Candida albicans*

<400> 239
 tcagatggtg atgaactgtc gattgaattt cttacaaaa gaagcaacac tccattaaca 60
 caaggaactt ataattatca taatacttct actaattcac ttaatttoca acaaccagaa 120

ccaattttatc gtaatcaaac tcgtacatct ttaagtgatt cttattatga tcatcccata 180
 ttgacactt ctcaaacaca gatccaacct ccacatgata atccattcac tgaaagttat 240
 gaaatgacag atacttcata tcaaggtaat gatcatcatt atcgtactgg tcaacctaata 300
 catctcatga accccactta taaccaagct ttcattcctc atgtttatga tgaagaagat 360
 aatgatgaac aagaatatga tcaacgtatt cagtataatc aatttcaagg ggatcatttt 420
 gatttggcag cgattagtta tgctgatgat gaaagtcaaa gtcagttgga ctatgtcccc 480
 actgaacgtg tcatacctga aggagaggaa gaagaagagg aaggtagagac gagttttgaa 540
 aaagaacctg gtagtgaaac catttctggc ccatttggag aagaacgatc atttgaagaa 600
 cctcctccac aacaagaagt c 621

<210> 240
 <211> 607
 <212> DNA
 <213> Candida albicans

<400> 240
 aactagggct gctaattgtg cactgaatt aactgctgct gcaccttatg aattgggtaa 60
 attatattat aatggatttg aagatattgt cttgattgat aaaaaatatg gattagaatt 120
 atttgctcaa gcagcagcat taggtcattt acaatcagcc gccattttgg gtcattcata 180
 tgaaattgga gaaattgttc ctcaagattc taatttatca attcattatt atactcaagc 240
 agcattagga ggtgatccaa attcaatgtt ggcaatgtgt gcttggtatt tagttggtag 300
 tgaaccatat ttacctaaag atgataatga agcatttgaa tgggctaaac gtgctgcaa 360
 ttgtaattta ccaaaagctc aatttgcttt agcaaatttt tatgaaaaag ggattggatg 420
 tattaaaaat attaatgaag ctcaatcatg gtataaaaaa gctgctgaaa atggtgatga 480
 aaaatctttg aaacgattaa ctgataaaga attgggttaa accattcaaa aacaatggaa 540
 aaagaacct ccagtaattc ataataaga tggaacttct acaactaatt caggatctct 600
 tgctcaa 607

<210> 241
 <211> 693
 <212> DNA
 <213> Candida albicans

<400> 241
 agtcagagca ggttcaatca tcaaaatcag atgtgatcaa gatttcgata gtgaaaaaga 60

agaggcagag aaatttacca aaattcagga tgagatttta caaacatttg ctacaaattt 120
 gccacaacca ccaaatttga aaatcaagaa cgttactcaa acctcgtgtg ttttagaatg 180
 ggataaacta aacttgggca cgcacacatt gaaaaatctt attttattca aagatggtaa 240
 aaaattaggc tcaattcctc agccattaaa taatcgaacc tcaaaattgt ctggattgcc 300
 aattgacaaa tcttttaaag tacaattacg tttggatacc actgctggta ctttcttgtc 360
 gaatgaaatt gaggtaacaa cccacaaaat gactgatttg tcaggaatta ctgtgtgtct 420
 tggtgacctt acacctaattg atcaattcaa caaggaggac attgaagagg cattaaagaa 480
 tatgggggca aaatatccag tgcaacaaca agtcaaagtc gacactacac atttcctctg 540
 tactagagaa aacaaacaaa atcctgaata tgtgaaggca aatgatatga acattccaat 600
 aattagacca gagtggttga aagcctgtga gagagaaaga agaatagttg gtgtagaga 660
 cttttatgtg aaagattgtg tcttaccoga cat 693

<210> 242
 <211> 511
 <212> DNA
 <213> *Candida albicans*

<400> 242
 gtcaacaaca aggcaagaca attttacttt cacttgagg agccacgggc aattacgggt 60
 tttcttccga ctcaagac gttcaatttg caggaacatt atggaataaa tttggagggtg 120
 ggaaagactc agaaagacct tttgacgatg caattgttga tgggtttgat tttgatattg 180
 aaaataaaga ccagacagggt tatgctgctt tagcgactca attaagaaaa tatttttagca 240
 ctggaactaa atcttattac ttgtcagctg ctccacaatg cccataccct gatgagtcgg 300
 ttggtgactt aatgtcccaa gttgatttag attttgcat tatacaattt tataacaact 360
 actgttcgct caatcagcaa ttcaactgga actcatggag caactatgcc agaggtaaaa 420
 gtattaaact ttatttgggc cttcctggct catcatcgtc tgctggctcc ggatttgttg 480
 gtttgtcgac tgttcaaaga gtcgtggcta g 511

<210> 243
 <211> 510
 <212> DNA
 <213> *Candida albicans*

<400> 243
 ctgtcaagaa actgacgttg acattgtttt attgtcattc ttgaatttgt ttccagatcc 60

attgaacggt aattttgcca accaatgtgg taacactttt gaatctgggt tgttacactg 120
 ttctcaaatt ggtgctgaca tcaaaacttg tcaatcttta ggtaaaaccg tgttggtatc 180
 tttaggtggt ggtgttggtg actatggttt cagcgatggt gcttctgcca ctaaattcgc 240
 agacaccttg tggaacaaat tcggtgctgg tgaagatcca gaaagaccat ttgatgacgc 300
 tgttggtgat ggtttcgatt ttgacattga acacgggtgg gctactgggt accctgaatt 360
 ggctactgcc ttaagaggca agttcgccaa agacacttcc aaaaactatt tcttatctgc 420
 tgctccacaa tgtccatacc ctgatgcac tcttggtgat ttattatcca aagtcccact 480
 tgattttgca ttcaccaat tctacaacaa 510

<210> 244
 <211> 577
 <212> DNA
 <213> Candida albicans

<400> 244
 ttggctcgat taagaaataa attaaattca aaatatatta tcacggtagc ggctcctggt 60
 ggtagtata atattgaaat tttgaagatt caagaaatgg ataaatattt gacatttttg 120
 aatttaattg gttatgattt tgctggtgaa ggctggtctt cgaaaaactgc tttccattct 180
 aatttatattg gtaataatgg ggataattca ttgaatgcat ctgatgttgt ccaaacttat 240
 attaacaagg gagttcatcc aacaaaattg atattaggga tgccaatgta tggaagaata 300
 tttcatgggtg ttgatcgacc agaaattggt attcctttta caaaagagag aaaatcagggt 360
 tgtatagaag ctgatgttgt ggactataac aaatttggtg atacattcga ttatgaagat 420
 ttgatccac gcaaagtggg tgcattgaaa tatgattccc atagtaagca attaattaca 480
 ttgataatc ccagtggtgc tagaataaaa gctagctttg tacaactgag acaattgggt 540
 ggtgggatgt ggtgggattc tgctggtgat gtttcag 577

<210> 245
 <211> 909
 <212> DNA
 <213> Candida albicans

<400> 245
 gctccatcta gcaactcatc tgggtgtcca gctgcgccat ctaacaattc atctggtgct 60
 tcagttgttc catcacaatc agccaacaat tcatctgctt cagctgctcc atctaacaac 120
 tcatctagtg ctatttctgg aagtgttgca ccatcaagct acggaaactc taccattgca 180

caaccatcta cttctacaaa atccgatgct gcatcaatta ctggccaat tactacagac 240
 aagggtataa ccaatgagtc tggcattgct ttacatcta cagtaatcat tacacatgtt 300
 tctgaatatt gtgaccagac ttctgctgct gctgttcaat catcagcatg tgaagaacag 360
 tcaagtgcta aatcagaaca agcttctgct tcatcagaac aagttaaggt cactactagt 420
 gtggttttgt gtgagtcac tattcaatct attgaatctg tcaaaacaag tgcagaagct 480
 gtcataaga ctgaggttat tgctagtgt gcaagtgaat taagctcttt gagttctgct 540
 aaatctgaag ctatgaagac tgtttctagt ttagttgaag ttcaaaaatc tgcagttgcc 600
 aaacaaacct cgttggtgct tgtacaatca tctgctgctt ctgtacaatt aagtgtgct 660
 caccgcaaaa agtcgtctga ggcagttgaa gttgccaaa ctgctgttgc tgaagcttct 720
 aaagctggtg atgaaatttc gactgaaatt gttaacatca ccaagacagt ttcttctggt 780
 aaggagactg gtgtttccca agctactgtt gctgctaaca cacattcagt tgctattgct 840
 aatatggcaa ataccaagtt tgccagcaca atgtcgttgt tggctgctag ttctgtgttt 900
 gttggtctc 909

<210> 246
 <211> 537
 <212> DNA
 <213> *Candida albicans*

<400> 246
 gacactccgt cagattcaac tccaactaaa aaaccagaac cgactataag tccagagttt 60
 agaaaaccca gcataagtct gttaacttct ccaagtgttg cacataaacc tccgccacta 120
 ccaccgtcac tgagtcctggt tggaagtagt gagcattcga gtgcaagatc gtccccggct 180
 atcacgaaga gaaactcgat tgcaaacatt atcgatgctt atgaagaacc agctactaaa 240
 actgaaaaaa aggtgagct aaactacca aagataaacc aactgacacc ggtgccaaag 300
 cttgaggaac acgagaatga tacaacaaa gtagaaaagg ttgtggatag tgcacctgaa 360
 ccaaaaccaa aaaaggagcc tcaaccagtt ttgacgacc aagacgatga cttgacaaaa 420
 atcaaaaagc tcaagcaatc taagaaacca cgtcggtagt aaacacctcc aatttggggc 480
 cagaggtggg ttccccaaa tagacagaag gaggaaacta atgttgatga cggaat 537

<210> 247
 <211> 561
 <212> DNA
 <213> *Candida albicans*

<400> 247
 acatagtcag ccacaaccac aaccacaagc aacacaacca agatcaaata gaagtagact 60
 gcaaacgagc ttttctaaac caagaggtag caggcaagtt agtggcagtg gcaggtcaac 120
 cggggccaag aaacaatcag caatcacact gggcagtact ggtactggcc ctgcccgaac 180
 tgctgatata ggtatgacat cagttgctaa tagcacttcc acaaccacta tgacaaccac 240
 caacaataac aacaaattgt ctgtttcagc ccagtaaat gtgatatatg ctaatcttcc 300
 tgagagactt caacaggtgt taccagcacc gccgttatca cgtgctccag taagacctga 360
 tgtaacggtc aatttgacat caaacgagc caaaagaaaa tcaaaattca ctccggaaca 420
 agatgacatg atcgtgaatt tgaagaaaaa ggggaaatca tgggttgaaa ttgccgaaat 480
 cactggtggt ggatcatatt tagcggcagc gaatcgattt caagttattg ttggacagca 540
 aggaaataac aattcgagtg c 561

<210> 248
 <211> 351
 <212> DNA
 <213> Candida albicans

<400> 248
 tcaagaaagc tactgatggt ggtccacacg gtgctatcaa tgtctctggt tctgaaaaag 60
 ccattgacca atctgttgaa tatgttagac cattaggtaa agttgttttg gttggtttac 120
 cagctcacgc taaagtcact gctccagttt tcgatgctgt tgtcaaatcc attgaaatca 180
 aagggttctta cgttggtaac agaaaagaca ctgctgaagc tattgacttc ttctccagag 240
 gtttaataca atgtccaatc aagattgtcg gtttatctga cttgccagaa gtcttcaaat 300
 tgatggaaga aggtaaaatc ttgggtagat acgtcttgga caccagtaaa t 351

<210> 249
 <211> 707
 <212> DNA
 <213> Candida albicans

<400> 249
 ctcatcctt tgctacaacc actacagtta ctgctcctcc aggtggtacc gatactgtga 60
 ttatcagaga gccaccaaac catactgtca ctactactga atattggtca caatcctttg 120
 ctactactac tactgttact gctcctccag gtggtactga ctcagtaatt atcagagAAC 180
 caccaaatac aactgtcact acaaccgagt attggtctca atcctttgct actactacta 240

cagttactgc tcctccaggt ggtactgact cagtaattat cagagaacct ccaaacccaa 300
 ctgtcaccac cactgaatat tgggcccaat cttacgcaac cacaactact gtgactgctc 360
 ctccaggagg cactgactca gtaattatca gagaaccacc aaaccacact gtcactacta 420
 ctgaatactg gtcacaatca tatgccacca ctaccactgt aactgcacca ccaggtggta 480
 ctgacactgt tatcattaga gagccaccaa accacactgt cactactact gagtattggc 540
 ctcaatcggt tgctactacc acaactgtaa ctgggtccacc aagtggcact gatactgtta 600
 tcattagggg accaccaaac ccaactgtca ccactactga atactggtct caatcatatg 660
 caaccactac taccattacc gctccacctg gtgaaactga taccggt 707

<210> 250
 <211> 586
 <212> DNA
 <213> Candida albicans

<400> 250
 aacggtcata tccaaagaag ttactggtgt tttcaaccaa ttcaattcat tgatatggc 60
 ttacacatac agagctcgat acgaagaaat atctactctt accgctaattg ctcaattgga 120
 atgggctttg gatgggtacta ttgccagtcg cggtgataca tttacattag tcatgccctg 180
 tgtatataaa ttcatgacgt acgaaacctc agtgcaatta actgccaaact ctattgcata 240
 tgccacatgt gactttgatg ctgggtgaaga cactaaaagt ttttcaagtt tgaagtgtac 300
 ggtgactgat gagttgacag aagataccag cgtttttggg agtggttattt tgcctattgc 360
 tttcaatggt ggaggttccg gatctaaatc tacgataaca gactccaaat gtttttcaag 420
 tgggtacaac actgtcacgt tttttgacgg aaacaatcaa ctttctacaa ctgcaaattt 480
 tcttccccga agagaactag cgtttgggtct agttgttagt caaagacttt ccatgtcgct 540
 cgatacaatg actaattttg ttatgtctac accttggttc atgggt 586

<210> 251
 <211> 692
 <212> DNA
 <213> Candida albicans

<400> 251
 aacattagaa acggaacagg ccgtcctcgt aagactccca gatccaagct ctatatggtt 60
 taccctccac tttcaggtga ggactcaaca aatcctgaac cagaagaggg tagttcacag 120
 gaaaacaatc ccacagaacc tagttcctca caatcaaatt cagtacaaaa tcaagaccaa 180

agtgaagacc agagtcaact accacaacaa gaactgaata cacaacaaga gctgaataca 240
 caacaagaac tgaatacgcc atcaccagc gcgtcaaaca catcaactga aactcctgct 300
 cctttaagtc ccatacaacc aggaattcga aatattcctc tgggattatt attaccacaa 360
 gaaaaagtgt gccgtcttat gggatatcca tttaccgcg attttaattt taccctaaat 420
 ccagagagat atcagaaaact tatttatgtg ttccagatac ttaaaaatgc tgctcgtaat 480
 cacagaaatg gagcttctct acttagaaag tatttcctgt tagcgagaag gtctaaaaga 540
 acaacagaca tgtttgtaac caccatagag gaaatgcgga agaggctgtt ggaaaatagt 600
 cgtaagagag agctcgagga agcgcaagaa aggggaagagt caaataaaaag acaacatata 660
 gaatcaagtg cagaaccaa tgcagaactg ag 692

<210> 252
 <211> 506
 <212> DNA
 <213> Candida albicans

<400> 252
 caaagttcca ccatttcaac tccagtagac tcattaccta caagtggaag aagtactcct 60
 aatccgaatg catcaaccac ttcattaaca tcattgaata ctgctcttgc taaattaaat 120
 gtttccaata ttccatttga agaaaatttg agtaatatg agaaagccgg taagatagct 180
 gagattagac ccgaagtggg aaccattgtt aagataattg atgaacaaga agatttatgc 240
 attattaatg aatggaaatt gaatgaaatt ttgaaatctt tattgaaacc taaaagtcct 300
 gcattagtta aagaaggagc tttattaatc attcaacaat tggcaactaa atttggtggt 360
 caaaccccca aagaagctta tttattacag tttttaagta ctgcttatga tatgtttact 420
 gataaagata aaaatgttgt taaagctgct aaatctgcta ctgatgcatt atttgggaatt 480
 taccctgtgg aagcattagg atcaat 506

<210> 253
 <211> 520
 <212> DNA
 <213> Candida albicans

<400> 253
 atcgacatca acaggcttac cacctaattg gacgattaga gtatccagat ccataacaa 60
 agagtatttc ttaaaccaat ctaccaatga gtcgtcttgg gaccacctt atggcactga 120
 caaagaagta ttgaatgcat acattgcgaa gtttaaaaac aatggttaca agccacttgt 180

gaatgaggat ggccagggtta gagtttctca tttgttgatc aagaacaatc aatcaagaaa 240
 acccaagtct tggaagtccc cagatggtat aagtagaact agagacgaat ctatacagat 300
 attgaagaaa catttggaagaa gaatattgag tggtagagggtt aaactaagtg aattggcaaaa 360
 taccgaaagt gattgcagct cacatgacag aggtggtgat ttagggtttt ttagcaaagg 420
 acaaagtcaa ccaccattcg aagaagccgc attcaatttg catggttgag aagtcagtaa 480
 cataattgaa accaatagtg gtgtccatat cctccaaaga 520

<210> 254
 <211> 507
 <212> DNA
 <213> Candida albicans

<400> 254
 caatagcaca ggcacaatct ggaactggta aaactgctac tttttctatt ggtatgcttg 60
 aggttataga tactaaatca aaagagtgtc aagcacttat cttgtctcct actagagagt 120
 tggcaattca aatacaaaat gtggatcatgc atttaggaga ttatatgaac attcacacccc 180
 atgcctgtat tggtagggaaa aatgtcgggtg aggatgttaa gaaattgcag caagggcaac 240
 aaatagttag tgggacacca ggtagagtga ttgatgtgat aaaaagaaga aatctacaaa 300
 ctagaatat caaggttctt attttagatg aagctgatga actttttaca aaagggttta 360
 aagaacagat ctacgaaatc tacaacatt taccaccttc ggttcaagta gtagttgtta 420
 gtgccacttt gccacgtgaa gtattggaga tgacaagtaa gtttaccact gatccagtga 480
 aaatcttggt gaagagggat gagattt 507

<210> 255
 <211> 535
 <212> DNA
 <213> Candida albicans

<400> 255
 ttcatcmeta ccagccttac cacaagataa actcacgggt gtagatgata tccctgatag 60
 agaacttacc gatattgaaa gaatcaacat caatgctgcc aattccaatt tacaagaaa 120
 attgaaaaca agacatttac aaatgatcgc tattggatca tctataggaa ccggtctttt 180
 cgttggtact ggtggtgcat taagtactgg tggaccagct gccattgttc tagcatgggc 240
 cataagtgtc atatcggtat ttatgacaat gcaaggatta ggtgaattgg ccgttgcat 300
 cccagtttct ggtggattca atttatacgc aagtaaat ttagaaccag gtattggatt 360

tgctgttggt tggaattatt tcttacaatt ctttgtatta ttgccattag aattagttgc 420
 tgggtgctata actatcaaatt attggaatgc tagtataaat tctgatgtgt ttgttattat 480
 attttggttt gtggtgcttg tgatcaccat gttgggtgta agatggtatg gtgaa 535

<210> 256
 <211> 433
 <212> DNA
 <213> Candida albicans

<400> 256
 cacaaggta tacattcaga aaactaaaac ttactgatta tgataatcaa tatttagaaa 60
 ctttaaaagt tttgacgaca gttggtgaaa tttccaaaga agatttcact gaattgtata 120
 atcattgggc ttcatgtcca tctatttata atccatatgt aatcaccaat gcatcaggta 180
 tagtggtagc cacggggatg ttatttgtgg agaaaaaatt gattcatgaa tgtggtaaag 240
 ttggtcatat tgaagatatt tcagttgcta aatctgaaca aggtaaaaaa ttgggatatt 300
 atttagtcac ttcattaacc aaagttgctc aagagaatga ttgttacaaa gtcattttag 360
 attgttctcc tgaaaatggt ggcttttatg aaaaatgtgg ttataaagat ggtggtgttg 420
 aaatggtatg tag 433

<210> 257
 <211> 540
 <212> DNA
 <213> Candida albicans

<400> 257
 aaaccataaa tcaacaacca cttgcttcgt caagatgggc tgcttgtgcc attggtggtg 60
 ttcttgcttc atttattcaa attcttgcca cacttttcga atggattttc gtgcctagag 120
 aatgggcccgg tgctcaacat ttgagtcgtc gtatgctatt tttggtgtta attttcttac 180
 tcaatttggt tccaccagtt tatacattcc aaattaccaa attggtgatt tattcgaaat 240
 cggcatatgc tgtgtcgatt gttggatttt tcattgctgt ggccacttta gtattctttg 300
 ccgtcatgcc attgggtggt ttattcactt catatcatgaa caagagatca agaagatata 360
 ttgcatcaca aacatttact gccaaactaca ttaaattgaa aggttttagat atgtggatgt 420
 cttatttggt atggtttttg gttttccttg ccaaattggt tgaatcttat ttcttctcga 480
 ctttgtcttt aagagatcct attagaaaact tgtcgaccat gacaatgaga tgtgttggtg 540

<210> 258

<211> 574
 <212> DNA
 <213> *Candida albicans*

<400> 258
 tattatggcg attccacaga gttgatattg gtgatatcac aaatatggaa cagcattatc 60
 atttccatgt acagggagca tgttctctcg gttgaacaag tttgcaagtt gatttatcaa 120
 cgaggagctg atgaaaacac tatacgacca ccactatttt ttgtttacga agatgataac 180
 aaattttatg attttattaa aatcgaaaag gaatgggaaa gaaggatcac attttttgct 240
 caatcgttat caagcccttt accagaacca tttccagtag tttctacacc aacatttacc 300
 gttttgattc ctctactctc agaaaaaata ctattaagtt tacaagattt aattaaagaa 360
 caaagctttt caaaactaac gttgctagat tatttgaaac aacttcattc gaaagaatgg 420
 gattcatttg ttcaagatag taagatgatc caaactataa aggaaatgga tgaagacaag 480
 tttgtacgcg aaaatatgga tgatttgccg tactactgta tcgggttcaa agattcttca 540
 ccagaaaatg ttttacgaac aagaatttgg gctg 574

<210> 259
 <211> 506
 <212> DNA
 <213> *Candida albicans*

<400> 259
 cgtttgttat ttgctgttcc taaaaagggc agattatacg aaaaatgctg taacttattg 60
 agtggtgccg atatacagtt tagaagatct aatagattag atatagcact ttctacaaac 120
 ttgccaatg cattaatctt cttgcctgca gctgatatcc cagttttcgt tggagaaggc 180
 aattgtgact tgggtataac tgggttagac caaatcaaag aagctgaaca attcgacaac 240
 atcgaggact tgttggtattt gaaatttggc tcatgcaaat tgcagatcca agttccagca 300
 gatggcgagt acgaaaagcc agaacagctt gttggaaaga aaattgtgtc ttcatttaca 360
 aaattgagta ccgactatctt caaacaattg tcagacaaac ctactaatat cagatatgtc 420
 ggtggttccg ttgaggettc ttgtgccttg ggtgttgctg atgctattgt cgatttggtt 480
 gaaagtgggtg aaactatgaa agcagc 506

<210> 260
 <211> 539
 <212> DNA
 <213> *Candida albicans*

<400> 260
agctaaatcc aaagacgatg acgcatcggc atatgtcggg gtcgggtcca tcgctgctgg 60
tggccgttac gacaatttag tgggtatggt ctccaacggg aaatccatcc cttgtgttgg 120
tgtatcgttt ggtgttgaga gattattctc catcatcaag aaccgtgcca atctcaacaa 180
catctccgcc aaccacactg acgtgtttgt tatggcattt ggcggcggcg aaggctggaa 240
cgggttctta aaagaaagaa tggaaatcac caacaagtta tggaaagctg ggatcaacgc 300
cgagtacttg taaaaatcca aagccaacat tcgtaaaciaa ttcgatgccg ccgaaaaggc 360
cggcgccaaa ttagctgtca ttcttggtta agaagagtac ccacaaggcc aattacgaat 420
caaagtgttg ggccagggag aggaaaacga aggtgagttg gtcaccaaag atgaactact 480
tgctgctgtc caggccaagc tcagctctga catcgacgac atttctcgca taatcaagg 539

<210> 261
<211> 1030
<212> DNA
<213> *Candida albicans*

<400> 261
gctaccactc caaacacttc tggtccaaca acttcttcag aatcaactac tccagctact 60
agcccagaaa gttctgttcc agttacttct ggatcatcta ttttagctac cacttcagaa 120
tcatcatctg ctccagctac tactccaaat acatctgttc caaccactac tactgaaacc 180
aaatcatcaa gtactccatt aactactact actgaacatg atacaactgt tgtcactggt 240
acttcatggt ctaacagtgt ttgtaccgaa agtgaagtta ctactggtgt tattgtcatc 300
acatctaaag atactattta caccacttac tgtccattga ctgaaactac tccagtttct 360
actgctccag ccactgaaac accaactggt acagtatcca cttctactga acaatcaact 420
actgttatta ctgttacttc atgttctgaa agctcttgta ccgaatctga agttactact 480
ggtgttggtg ttgttacttc tgaggaaact gtctacacta cattctgtcc attgactgaa 540
aacactccag gtactgattc aactccagaa gcttccattc cacctatgga aacaattcct 600
gctggttcag aatcatccat gcctgccggg gaaacctctc cagctgttcc aaaatcagat 660
gttccagcta ctgaatcagc tccagttcct gaaatgactc cagctgggtc acaaccatct 720
attcctgccg gtgaaacctc tccagctggt ccaaaatcag atgttccagc tactgaatct 780
gtcctgtctc ctgaaatgac tccagctggt actgaaacta aaccagctgc tccaaaatca 840
tcagctcctg ccactgaacc ttccccagtt gctccaggta ctgaatccgc accagctggt 900

ccagggtgctt cttcttctcc aaaatcttct gttttggcta gtgaaacctc accaattgct 960
ccagggtgctg aaaccgctcc agctggctca agtggtgcta ttactattcc ggaatctagt 1020
gctgtcgtct 1030

<210> 262
<211> 528
<212> DNA
<213> Candida albicans

<400> 262
ttgggtgggtt agaagttgag aaagggtgctt ctttatttat taagctggac aatggtcctg 60
tcttagctct taatgtcgtt ttatcaactt tagttagacc agttataaat aatggtggtta 120
tttcattaaa ttctaaatct tctacaagtt tttcaaattt tgacattggt ggatcttcat 180
tcactaataa tgggtgaaatt tatcttgatt cttcgggtct tgttaaaagt acagcctatc 240
tttatgcacg tgaatggact aataatgggt taattgttgc ttatcaaaat caaaaagctg 300
ctggtaatat tgcttttggg actgcttata aaaccatcac taataatggc caaatttggt 360
tgcgtcatca agactttggt ccagctacaa aaatcaaagg tactggttgt gttactgctg 420
atgaagacac atggattaaa cttggtaata ctattttatc agttgaacct actcataatt 480
tttacttgaa agatagtaaa tcgtctttga ttgttcatgc tgtttcaa 528

<210> 263
<211> 528
<212> DNA
<213> Candida albicans

<400> 263
caagagaaag ggaaagaaga gaaaaaggac acagcctttc aaacatcttt tgatagaaat 60
tttgatcttg ataattcaat cgatatataa caaacaattc aacatcagca acaacagcca 120
caacaacaac aacaactctc acaaaccgac aataatttaa ttgatgaatt ttcttttcaa 180
acaccgatga cttcgacttt agacctaacc aagcaaaatc caactgtgga caaagtgaat 240
gaaaatcatg caccaactta tataaatacc tcccccaaca aatcaataat gaaaaaggca 300
actcctaaag cgtcacctaa aaaagttgca ttactgttaa ctaatccoga aattcatcat 360
tatccagata atagagtcga ggaagaagat caaagtcaac aaaaagaaga ttcagttgag 420
ccacccttaa tacaacatca atggaaagat cttcttcaat tcaattattc tgatgaagat 480
acaaatgctt cagttccacc aacaccacca cttcatatga cgaaacct 528

<210> 264
 <211> 360
 <212> DNA
 <213> *Candida albicans*

<400> 264
 cgttaactca gtcataact acattttatt cctttttgca tcaacaatcc ttgcggcaga 60
 taaaacgtcc agttcagtat cacctacttt agtatgggtc acaggtactg atgccaatgg 120
 gaaattagcc accaccaat caacatatta tcaaagcttt atgagtactt ataccacagc 180
 tgaaaccca tcgtctggtt ctattggatt ggggtcaatc agtgaacag taggagaaat 240
 cagaacttat agtatgacta ctatatcaca aggtaatggt gggttatcaa aattcaatca 300
 aaatggttta gaaatgaaga atttgtcatt tgttaaatta attggggttt cttttattgc 360

<210> 265
 <211> 701
 <212> DNA
 <213> *Candida albicans*

<400> 265
 gatccagatg ctgtaaccac agccaatgga acattaaatt tacgtatgga tgcttataaa 60
 aatcataatt tattctatcg ttcaggaatg gtacaaagtt ggaatcaatt gtgttatact 120
 caagggtcatt tagaaattct ggctcgttta ccaaattatg gtaatgtaac agggttatgg 180
 cctggggttat ggtctatggg gaatttaggt agaccagggt atttgggatc tactgatggg 240
 gtatggccat attcttacga ttcatgtgat gccggtatta cacctaatac atcttctcct 300
 gatgggattt cttatttacc aggtcaaaga ttaaataaat gtacatgtcc aggtgaatta 360
 catcctaata gaggtgttgg tagaggltgcc cctgaaattg atgttattga aggtgaagtg 420
 atgactgata gtagtggtaa aaaagaaaat tgtggtgttg cctctcaatc cttacaattg 480
 gccctatgg atatttggtg tattcctgat tataattggg tggaatcta caatttttca 540
 gtttcaacga tgaatactta tactgggtgga ccattccaac aagcattatc agcaacaacc 600
 atgttgaatg ttacatggta tgaatttggt gataatgccc ataatttcca aacttatggt 660
 tatgaatatt taaatgaccc tgaacgggt tatttacgat g 701

<210> 266
 <211> 794
 <212> DNA
 <213> *Candida albicans*

<400> 266
 taatttccct tgttgtttcc ataataagat gtgttgttgc agatgttgac atcacatcac 60
 caaagagtgg agaaactttt tctggtagtt ctggatcagc aagtatcaag attacctggg 120
 atgattcaga cgattcagac tcaccgaaat ctttggataa tgccaaaggg tacacaattt 180
 ctttatgtac tggacctact tcagatgggg atatccagtg tttggatcca ttagtcaaga 240
 acgaagctat tgcaggtaaa tctaaaacag tttctattcc ccagaactca gtacctaatg 300
 gttattacta tttccaaatt tacgttactt tcactaatgg aggtaccact attcattatt 360
 caccacgttt caaattgact ggtatgtctg gtccaactgc cacttttagat gtcaccgaaa 420
 caggatcggg gccagcggat caagcttcag gatttgatac tgcaactact gccgactcca 480
 aatctttcac agttccatat accctacaaa cagggaagac cagatacgca ccaatgcaaa 540
 tgcaaccagg taccaaagtg actgctacaa cctggagtat gaagttccca actagtgtctg 600
 ttacttacta ctcaacaaag gctggcacac caaatgtggc ctctactatt accccagggt 660
 ggagttatac tgctgaatct gccgttaact atgctagtgt tgctccatat ccaacatact 720
 ggtatcctgc cagtgaacga gtgagtaagg ctacaattag tgctgtaca aagagaagaa 780
 gatggttgga ttga 794

<210> 267
 <211> 654
 <212> DNA
 <213> Candida albicans

<400> 267
 acattcattg ggttcatctc cagaaaacaa taatgccctg ggtccattaa gtggagttcc 60
 aactccatca ttttctaatt tgaatgatta tttccaacaa aaaagtaaca gcaataattc 120
 tcgattatth aatgctagtt catcatcatt gagttcatta agtggaaaaa taagatcttc 180
 ttcacgact aatttagctg gtttacaag attaaactcca ttaactagta ctacaaacaa 240
 tacaacaaac acaacaacat ctaatactaa taataataat atgacaaaac caagtataat 300
 accaaaacaa ccatcttcta catcattaaa tttagaatth tataatggca acaatcaaca 360
 acaacagaat tatcataccc ataagaaatc tcgaccaaatt tcaccatcac aaacccaat 420
 tcatttatca agttcacgta aaagcgctaa taatctgtth ataatatcac ctaatgaaac 480
 cccattacaa actccattac aatcaccaca attaaaacca tatcaagatc aaccaccaac 540
 taatgtcaat atcaacgtta gtgcaccatc agatacatth attggaactg ctgttactga 600

aaaattaaat aatattagta gtattgctgg taatggaaca caattaccac caat 654

<210> 268
 <211> 529
 <212> DNA
 <213> Candida albicans

<400> 268
 tgtcccagaa agtgctaaac acattttcaa ccaagaaact ttagcatttg ttgccacttt 60
 gcaccgtggt ttcgaaacca gaagacaaga attggtgaac aacagaaagg aacaacaaaa 120
 attaagagat caaggtttct tgccagatct cttaccagaa actgaatata ttagaaatga 180
 tgctacctgg actgggtccac cattggctcc aggttttagtt gacagaagat gtgaaatcac 240
 tgggtccaacc gacagaaaaa tgggttatcaa tgccttgaac tccaatgttg ctacttatat 300
 ggccgatttt gaagattcat tgaccccagc ttggaaaaac ttggttgaag gtcaagtcaa 360
 tctttacgat ggtgtcagaa gaaacttgac tgctaacatt aatggtaaaa attatgcctt 420
 gaacttggaac aaaggtagac acattccaac gttgattgtg agaccaagag gatggcattt 480
 ggatgaaaag catgtattgg ttgacggtaa accagtttcc ggtggtatt 529

<210> 269
 <211> 647
 <212> DNA
 <213> Candida albicans

<400> 269
 ttagctcatc aacatcatca acataaagaa gaaaaaagag ctgttcatgt tgttaccacc 60
 accaatgttg ttgttgtcac cattggtaat ggtgatcaaa ctaccacttt tgctgctcca 120
 tctgtagctg ctgattctag tgtagtggt tctgtcaaca ctgaaccacc tcaaaatcac 180
 ccaactacta ctcaagatgt tgcttctgct tctacttata catcttccac tgatggttct 240
 gccgcttctt cttctgctgc cgcttcttct tcttctcaag ctggttctga accttctggt 300
 ggtgttggaat ctggtggtgc taaagggtatt acttattctc catacagtga caatggtgga 360
 tgtaaatcat catctcaaat tgccagtga attgctcaat tatctggatt taatgtcatt 420
 cgtttatatc ggggtgattg tgatcaagtt gcagctgtat taatagctaa aacttcatct 480
 caaaaaattt tcgctggtat tttcgatggt tctagtatta catctggtat tgaaagttaa 540
 gctgaagccg ttaaaaagtat ttgcggtagt tgggatgata ttacactgt ctctattggt 600
 aatgaattgg ttaatgctgg ttctgccact ccaagtcaaa ttaaagc 647

<210> 270
 <211> 636
 <212> DNA
 <213> *Candida albicans*

<400> 270
 actgtcgttt ctggtcattc tggtaaagat acttcctctt ctaaatacaac tgttgccgaa 60
 tacactgggg ttgaagaaat cactaccacc ttgaattatg actatttagt tgttggtggt 120
 ggtgctcaac catctacttt cggatttcct ggagtcgctg agaattcaac ctttttgaaa 180
 gaagtcagtg atgcttctgc tattagaaga aaattgatgg atgttattga agctgccaat 240
 attttaccta aagatgaccc agaaagaaag agattattgt ccattgttgt ttgtggaggt 300
 ggaccaacgg gtgttgaagc tgctggtgaa atccaagatt atattgacca agatttgaag 360
 aaatgggttc ctgaagttgc cgatgaattg aaagtctcct tgggtgaagc ttaccaaac 420
 gttttgaaca catttaacaa gaaattgatt gactatacca aagaagtttt caaagacact 480
 aatatcaatt tgatgactaa taccatgatc aaaaaagtca atgataaaag tttgattgca 540
 aaccataaaa accctgacgg atctactgag tctattgaaa ttccatattg tcttttaatt 600
 tgggctactg gtaatgcacc aagagatttc actcgt 636

<210> 271
 <211> 666
 <212> DNA
 <213> *Candida albicans*

<400> 271
 ggtacgaaca gacaaacacc tgaagaaact gacattggta tgattgcca ttattttgaa 60
 aaataccagt ttgacgggtt aattattggt ggaggttttg aagcatttgt ttcgttagag 120
 caattggaaa gatcaagagc tatgtatcca tcgttcagaa ttcctatggt tttaatccct 180
 gccaccattt caaataatgt tcctggtacc gaatattctt taggggctga tacctgtttg 240
 aattcgtaa tggaatattg tgacattgac aagcaatcag cttcagctac cagaggtaca 300
 gcatttatta ttgatgttca aggaggtaat tccggataca ttgccacatt tgcctcatta 360
 atcagtggag cacaagcatc ctatgttcca gaagaaggta tttcattaca gcaattggaa 420
 atggatatca attcattgag agaagcattt gccgtggaac aaggaatgac aaagagtgg 480
 aaattgatca tcaagtcgag taatgcaccc aaagtaacta cccacacac attggctgac 540
 atattcaacg atgaatgtca cggtgacttt gacactaaga cagctattcc gggacacgac 600

caacaagggtg gattaccttc accaatagat agaagcagag gtgatagatt tgccattaga 660
gctggtt 666

<210> 272
<211> 588
<212> DNA
<213> Candida albicans

<400> 272
ttagccaagt ttgaatcgtc caccacacca gttgaagttg ttgtaacaa attttatttt 60
tccaataatg ggtctcagtt tttaatcagg ggtatcgctt atcagcaaga tgccgcgggc 120
tcagtttctt ccggttacga cgccgatcct aatagaaaat acaatgatcc tttagccgat 180
gctgacgctt gtaaacgtga cgtcaagtat ttcaaagaat caaacaccaa tactttgaga 240
gtttatgcta ttgaccaga taaggatcat gaagagtgtg tgaaaatttt cagtgcgct 300
ggtatttaca ttgttgctga tttatcagaa ccaactgtat cgattaacag aaacaacca 360
gaatggaact tggatttata caaacgttat acaaaagtca ttgataagat gcaagaatat 420
tctaattgtt tgggattttt tgctggtaac gaagtaacta ataatcgctt aaataccgat 480
gcttctgcat ttgttaaggc tgccattaga gatatgaaga aatacatcaa ggagtctgat 540
tatagacaaa ttcctgttgg ttattcatcc aatgatgacg aagaaatt 588

<210> 273
<211> 609
<212> DNA
<213> Candida albicans

<400> 273
tcaatcttgg ctgctacttc attcgtttct tccgtggctg ccgaagattt gcctgctatt 60
gaaattgttg gtaacaaatt cttctactcc aacaatggat cccaatttta catcaaagg 120
attgcttacc aacaaaataa cttggactcc aacgaatcat ttgttgaccc attagctaat 180
cctgagcact gtaaaagaga tattccatac ttggaagctg tcgactacga ctccaatgtc 240
atcagagttt atgctttaga caccagtcaa gaccatactg aatgtatgca aatgttgcaa 300
gatgccggtg tttatgtcat tgccgatttg tccaaccag atgaatccat caacagagac 360
gaccatcct gggatttgga tctttttgaa agatacactt ctgttgctga tttgttccac 420
aactacacta acattttagg tttctttgcc ggtaatgaag tcaccaacaa gaaatcaaac 480
actgacgctt ctgctttcgt taaggctgct atcagagata ccaaagccta catcaaaagc 540

aaaggttaca gaagtattcc agtcggttac tctgccaatg atgattccgc catcagagtt 600
tcattagcc 609

<210> 274
<211> 684
<212> DNA
<213> *Candida albicans*

<400> 274
attgggtatc aacaccattc gtatttattc aataaatgca cacctaaacc acgataaatg 60
catgaccatg ttggccaaag caggaatata cttgtttcta gacgtaaact cgccattgcc 120
acaccaccac ctaaaccgat acgagccgtg gaattcgtac aacttgtaact actttgaaaa 180
tgtctttaag gtggtagaac agttttccca ctacaacaac acgctagggt ttattgccgg 240
gaacgaaatt gtcaacgacc ccatctccgc cagtgtggct gcccataatg tcaaagcggc 300
ggtcgcgcaa atcaaaagct atatcgaata caatgcacca agaaccatcc ccgtcgggta 360
ttcagcggcc gacgacttga actatcgaat gccactagca cagtacctcg agtgtggcga 420
cgacaacccc aaagaatcag tcgactttta tggcgtcaac tcgtaccagt ggtgtggcga 480
ccagacattc tacagcagcg ggtacaacat cttggtcaac gattacaaac atttcaccaa 540
accaatgttt ttttcggaat atgggtgcaa tgaggtgttg ccgagaaatt tcgatgaagt 600
cccagtattg tacacaaacg atatgataga tgttttcagt ggcggattgg tatacagagtt 660
caccagga ccaaacaact atgg 684

<210> 275
<211> 532
<212> DNA
<213> *Candida albicans*

<400> 275
attagctgaa catgccagag accacacatt gagattcggc agcaaatcgc catttttcag 60
aaaatacttt ggaaatgaca ctgcaagtgc tgaggtcgtt ggtcattttg aaaatgttgt 120
cgggtgctgac aaatcatcca ttttgtttct ttgtgatgac ttagatgata agtgcaaaaa 180
tgatggctgg gctggctatt ggagaggttc caaccatagt gatcaaaacta ttatttgtga 240
cttatctttt gttaccagaa gatacttata ccaactatgc tccggtggat ataccgtctc 300
gaaatctaag acaaacattt tttgggcagg tgacttgta cacagattct ggcacttgaa 360
atcgattggt caacttgta ttgaacatta cgctgacact tatgaggagg ttcttgaatt 420

ggctcaagaa aattcaactt atgctgtaag aaactcaaac tcattgattt attatgcttt 480
 ggatgtgtat gcatatgatg tgacaattcc cggcgaaggg tgcaatggag at 532

<210> 276
 <211> 506
 <212> DNA
 <213> Candida albicans

<400> 276
 gatttacacg cctcacaaat tcaagggttt ttcgatgttc cagtagataa cttgtacgct 60
 gaacctagtg tggtagata catcaaggaa actattgatt atagtgaagc tataattata 120
 tcttctgatg ctgggtggtg caagagagct gctggattgg ccgatagact tgatttgaat 180
 tttgaattga ttcataaaga aagagccaga gctaatagaag tatctcgaat ggtttttagtt 240
 gttgatgtca ccgataagat ttgtgttatt gttgatgata tggcggatac ttgtggtact 300
 ttggctaaag ctgccgaagt attgttagat aataatgcta aagatgtcat tgccattgtc 360
 actcatggta tattatctgg gaacgcaata aaaaatatca acaattctaa attgaaaaaa 420
 gttgtatgta ccaacaccgt tccatttgaa gacaaattga aactttgtct taaattggat 480
 acaattgata tttctgctgt tattgc 506

<210> 277
 <211> 606
 <212> DNA
 <213> Candida albicans

<400> 277
 taccacgata gtcctatttc ccttagtggt tccaagaaca agagagaagc tgaaattgtc 60
 aatgaagatg gtacaattga aaagagaact tttggaagcg ctggtgtaaa tgccggtttc 120
 aatgccgcat ttgtcgtgtc taatgccaaa aaattatctg acggttctta tggattgat 180
 tgtaacttca agagtgattc ttctgtccaa ttgaacctgg cctttggtaa aaaagttaa 240
 caattgagta tcaccggtac tggttattct gatatttcat tattaggaaa tgttgcta 300
 ccatttgaat ggtcagcttc cttgaaagtc aaagcagaaa ttgttaaagg aaaatgttgt 360
 cttccatcag gtttcagaat cgttacagat ttcgaaagca actgtcctga atttgatgcc 420
 atcaaacaat tttttggcag ttctcaaata atttacaag tcaatgccgt ttctaacgca 480
 attggtactt ttgatgcttc tgcattatc aatgctcaag tcaaagcctt ccctgccaag 540
 agagaattag atgaatttga agaattaagt aacgatgggtg ttactcacag caagagaact 600

ttgggt 606

<210> 278
<211> 625
<212> DNA
<213> *Candida albicans*

<400> 278
gtgggtgttac tgttggtgaa actgccaccg ttgctacaac tgttaccgtt ggtgcaactg 60
tcactgggtgg tgaccaaggt caagatcaag ttcaacaatc agctgctcca gaagctggtg 120
atattcaaca atcagctggt ccagaagctg atgatatcca acaatcagct gttccagaag 180
ctgaaccacac tgccgatgct gatgggtggtg atgggtattgc aattaccgaa gtctttacca 240
ctaccattat gggtaagag attgtttatt ccgggtgtta ttacagttat ggtgaagaac 300
atacctatgg agacgttcaa gttcaaacc tctactattgg ggggtggcggc tccccttcag 360
atgaccaata tcctacaact gaagtttctg ctgaggtctag tccatctgct gttactactt 420
cttctgctgt tgctactcct gacgccaag tcccagactc tactaaagac gcttctcaac 480
ccgctgctac tacagctagt ggctcctctt ctggtagtaa tgactttagt ggtgttaaag 540
ataccaatt tgctcaacaa atcttggatg ctcacaacaa aaaacgtgct agacatggtg 600
ttccagattt gacttgggat gctac 625

<210> 279
<211> 220
<212> DNA
<213> *Candida albicans*

<400> 279
aagagatgat cctcatacta ttgaagcctt gagacaacaa caacaacaac cagtctcaac 60
ttctgaaggt caacaagttg ctcaaagaat tgggtgctgct gattacttgg aatgttctgc 120
taaaaccggt agaggtgtta gagaagtgtt tgaagctgct actagagctt ctttaagagt 180
taaagaaaag aaggaaaaga agaagaaatg tgttgtcttg 220

<210> 280
<211> 531
<212> DNA
<213> *Candida albicans*

<400> 280
taagagagat ggccgtaaag agccagtacg tttcgacaaa atcactgcca gagtcaaaag 60
attatgttac ggtttgaatc caaaccacgt tgaaccagtt gctattaccc aaaaagttat 120

atcaggtggt taccaggggg ttactactat tgagttggac aacttggctg cagaaattgc 180
 tgctacaatg acaacaattc acccagatta cgctgtctta gccgctagaa ttgccgtatc 240
 aaatttacat aagcaaacca ccaaacagta ttccaaagtg tctaaggatt tatatgaata 300
 cattaatcct aagactgggt tacactctcc tatgatttcc aaggaaacct acgacatcat 360
 tatggaacac gaagatgaat taaactcagc cattgtttac gacagagatt ttaactacaa 420
 ttattttggg ttcaagactt tggaaagatc atatttggtta cgtatcaacg gtaaggttgc 480
 tgaaagacca caacatttga tcatgagggt tgctgtcggg attcacggta a 531

<210> 281
 <211> 453
 <212> DNA
 <213> Candida albicans

<400> 281
 ttttggacct caaatggacc agtatttgag agaaaaacta ttaagtgatg tggaaggtag 60
 atgtacaggt caatttggtt acattgtgtg tgttttggat tcaatgaata tagatgttgg 120
 caaggaaga ataattccaa gtactgggat ggctgaattt gaagtcaa atagagctgt 180
 tgtgtggaaa ccattcaaag gtgaagtggg agatgcagtt gtaacaaccg tcaataaaat 240
 gggatttttc gccgatgttg gccattatc agtgtttggt agtaccatt tgataccttc 300
 agatatgaaa tttaatcctt cagcaaacc accagcatat gtgagtcccg atgaaaacat 360
 tgaaaaggga tcgagggtta gattgaagat tgttgtgaca agaactgatg tcaatgagat 420
 ttacgccata ggaagcataa aagaagacta ttt 453

<210> 282
 <211> 525
 <212> DNA
 <213> Candida albicans

<400> 282
 ccaagaactt accattattg aacaaccact tcagaaagca ctggcaagaa agagtcagag 60
 ttacttttga ccaagctggg aaaaaagctt caagaagaca atctagattg agaaaagctg 120
 ccaagattgc cccaagacca atcgatgctt taagaccagt cgtcagagct ccaactgtca 180
 aatacaacag aaaagtcaga gccggtagag gtttactttt ggccgaattg aaagccgttg 240
 gtattgctcc aaaatacgcc agaaccattg gtatctcagt tgaccacaga agacaaaaca 300
 aatctcaaga aacttttgat gctaacgtcg ccagattaca agaatacaaa tctaaattag 360

ttatctttga caaaaagacc aaggcttctg aagttgcttc tttcgaacaa gttgatgtct 420
ctgccacctt cccagttgaa caaccagctc cagaatctgg tttgagagct gttgaagttc 480
cagaacaaac tgcttacaga accttgagat tggctagaaa cgaaa 525

<210> 283
<211> 400
<212> DNA
<213> Candida albicans

<400> 283
ttaaaggatt caaaaagggt gtccttaggg cccacagac aatgcgtcag aaattcaaca 60
tgggagaaat cacccaagat gctgtttata tcgatgctga aagaagattc aaagaaatcg 120
aaacggaac aaaaaagttg agtgaagaat ccaagaaata tttcaatgct gtcaatggga 180
tgttagatga acaaatgat tttgccaaag ccgtggctga gatttataaa ccaatcagtg 240
gtagattata ggacccagat gctacggtac cagaagataa cccacaaggt attgaagcat 300
cggaactgta ccaagcagtg gttaaagatc tcaaagatac cttaaaaccc gatttggaat 360
tgattgaaaa aagaattggt gaaccagcac aagaattatt 400

<210> 284
<211> 522
<212> DNA
<213> Candida albicans

<400> 284
catggcacca gaaagaacca ccaattataa caccatcgt ttaatcaacc aattaattga 60
tatgaatcaa tatgagtcaa ttgaaatcaa tgggacaaca gtgacaaaat caaactgtaa 120
atatttacct acattggctg gggatatatt gtcattggga gtattgttca ttaatatac 180
ttgttcaaga aacccatggc ccattgcac atttgataat aatcaaaata atgaagtgtt 240
taagaattat atgttgaata ataacaaggc tgttttgagc aaaatcttac ccatttcctc 300
acaatttaat cgcttattag atagaatatt caaattgaat cctaatagata gaatagattt 360
accaacttta tacaagaag ttattcgttg tgatttcttc aaagatgac attactacta 420
tgcccaacat caacatcac acaatcaca tcaaatcaat aatgcttaca atcactatca 480
gaaacaacct aatcaagcaa gacctactgc aaaccaacaa tt 522

<210> 285
<211> 500

<212> DNA

<213> *Candida albicans*

<400> 285

tataatgccc cgaaaataaa gtttaccgat actgaaggac aagaagaaca tttttatttc	60
aatcggagta acaattcaac caatgattta accagtcattg actcttcattc aactcaacta	120
caagatgccg attccagaag acaagcccca ccaccaccac cacataatcc attttctgac	180
aattcccatg aaaatagtag tgaatcatta tatcaatcag aaacaagatt tcatcaacca	240
ctacttcata atgatagtaa taatagcaat agcagtatag gcaataatag acaacgtatt	300
ccatcacaaac aacatgatac actgtcatta tattcagcat caccaatatac aacatcacct	360
ttagtttcta attttcaatc atatctggac aaccaagacg aaatgactcg aggttaagtat	420
aaccagaata caaatcggtc aagttcaaat tatattcaac acagtccaac atcagcaggg	480
tacgatagat atccgcttaa	500

<210> 286

<211> 279

<212> DNA

<213> *Candida albicans*

<400> 286

tggaacctgt ttgtacttga cgtcattgtc gaaaaaacac ccagagaaat tgtgtaaaga	60
gaaatacgtc cacggcggta acgtgttgat cgacccaact gccaaagatcc acccatctgc	120
cttaatcggc ccaaactgca ccacgggtcc aaacgttggt gtcgggtgaag gtgctagaat	180
ccgaagatca gtgttggtgg ccaactccca agtcaaagac cagcctggg tcaaactctac	240
cattgttggt tggaactcca gaattggaaa gtgggctag	279

<210> 287

<211> 597

<212> DNA

<213> *Candida albicans*

<400> 287

gatttcctag ccggaatgca cgacaatcct gagacggaag tcgatcgtcg atgcccattg	60
tgctgtgtga aaaattttct tagaaaattt gttctttcct tcaactgctt ttaagaaaga	120
gaggttcaag tggtttaagt acgacgggtc caaagattgc ggcttatgag gcccgaaactg	180
agttgaaata caaatcaag atataattat ataccttact tgtccatatt gttttataat	240
acattcttca gatattttaa tttctgtgta tcaacctata aaacagagat acattcagtg	300

catttagtat actgagtga ctggtacctg tgacattcaa gataactgtt tcgcgcacgc 360
 tggcagacga acagattaga agcttggtaa agttctgctt tgctcaatag gtttcagatt 420
 cagaaagatt gttaaaactt agatcatctt cgttcatcac aaaccaagaa ctttacggaa 480
 tgtacgaata tcactttcat tagtagataa ttcgttactt aatccagtga ttaatcttga 540
 ggttcgaaag atggttaata gaaatttatt tgacaattac gactaagggt acataat 597

<210> 288
 <211> 350
 <212> DNA
 <213> Candida albicans

<400> 288
 aagacgactg agcgtgtccc ttttgataa actttataat tttcaatgaa tcttttacct 60
 cattgggttc aacaccgcca ctaacatcgt agcccaaat gttgtcaa atgtaggcaa 120
 tctcaggggt tagccacca gcaagtatag cttttgtagg taactttctca ataaacgtcc 180
 aatcaagtaa cttcccttca cccccaactt ccgaatcaag caacggcaaa ctcacacatt 240
 gcgttaacag caagctctgc ttttccaaaa ggtctagctc gtcaggaaca acatacctgg 300
 gaattaacct aaattctgta cccaaaaact cttagcttatt ttccagtcca 350

<210> 289
 <211> 330
 <212> DNA
 <213> Candida albicans

<400> 289
 acatgtcaag aggattgttc atgtaagaat aatgaagccc ccacaacaaa gacaactgcc 60
 accacaacta atgttggtga tggccctggc cctggcccta tccctggcaa taatgatgat 120
 gatgatgatg acatttggtc agatgatgat acgaaactaa tacctgaaaa tgatataata 180
 cgatcacatt ataaaaaagg gtatgttgat gggataactc aagctaaaga atcttcatta 240
 caacaaggat ttgatgatgg atatcctgaa ggtgcaaaat tagggattaa agttggtgaa 300
 attttagcaa atttaataca tcaatgtaaa 330

<210> 290
 <211> 524
 <212> DNA
 <213> Candida albicans

<400> 290
 gccgaagata ctaaaccaaa gactgaagaa tcattctcta ttccaaaacc accaacttct 60

aatgtattct ccatgttttg tgccaaaaa gagaaaaaac cagaacaaga agattcagac 120
 aacaagaaag aatccgataa aaaggaagaa aaagatacta gcaaatcaac tggatgatgat 180
 aatgaagtag ctgaagaaga agaagctgat gtcgaattta ctccagttgt tcaattggat 240
 aaaaaagttg acgttaaaac caatgaagaa gatgaagaag tcttgtataa agttagagcc 300
 aaattattta gattccatgg tgattcaaaa gaatggaaag aaagaggtac tggatgatggt 360
 aaatttttaa aacataaaac tactggtaaa gttagaattt taatgagaag agataaaact 420
 ttgaaaattt gtgctaatac tttgatttct gctgattatg aattgaaacc aaatattggt 480
 tctgatagat cttgggttta tactgttact gctgatgttt ctga 524

<210> 291
 <211> 513
 <212> DNA
 <213> *Candida albicans*

<400> 291
 tctgatgttg ctgtttgttc ttcaagaact ttcggtcaaa gagctgtttt gaaatttgct 60
 gctcacactg gtgctactgc cattgctggt agattcactc caggtaactt taccaattat 120
 atcactcgtt cattcaaaga accaagatta gttgttggtta ctgacccaag aaccgatgct 180
 caagccatca aagaatcatc ttatgttaac attccagtta ttgccttgac tgacatggac 240
 tctccatctg aatacgttga tgttgccatt ccatgtaaca acaaaggtaa acactctatt 300
 ggtttaatct ggtggttgct tgctagagaa gtcttgagat taagaggtat tatcccagac 360
 agaactaccg aatggctcagt tatgccagat ttgtacttct acagagaccc agaagaaatt 420
 gaacaaaatg ccgtcgaaga agctaaaact gaagaagttg aagaagctcc agttgctgaa 480
 gctgaaaccg aatggactgg tgaaactgaa gat 513

<210> 292
 <211> 613
 <212> DNA
 <213> *Candida albicans*

<400> 292
 tcgaccatac catccaatac ttgaatcatt ggaatttcaa accaatcaac atttaattca 60
 agaattattct ttagatattg tcaatacttt atctcaattg gaatcactta cattagttaa 120
 tcctgccatg attgatattac aaccagaaat tcaatggttt atgcgtccat ttttattaga 180
 ttttttaatt gaattgcatt cttcatttaa attacaacca acaacattat ttttatgtct 240

taatattatt gatagatatt gtgctaaaag aattgttttc aaacgtcatt atcaattagt 300
 tggttgtaca gcattatgga ttgctagtaa atatgaagat aaaaaactgc gtgtaccac 360
 attaaaagaa ttaacaataa tgtgtcgtaa tgcttatgat gaagaaatgt ttgttcaa 420
 ggaaatgcat attttaagta ctttagattg gtcaattggc catccaactt tagaagattg 480
 tctacaatta gccattgatc tgaataatct atctaacaac accactaatg atattgaaaa 540
 caaaagtgtg cgtcctaata ggaaatcaag tatatcatca gctgtaactg ctgttgctag 600
 gtttctttgt gaa 613

<210> 293
 <211> 251
 <212> DNA
 <213> *Candida albicans*

<400> 293
 agaaatttgg cctgatgtta attatttacc agattttaaa tcaagtttcc ctcaatggaa 60
 aaagaaacct ttgagtgaag cagttccaag tttggatgct aatggaattg atcttttgga 120
 tcaaatgttg gtgtatgatc caagtagaag aataagtgtc aaacgagctt taattcatcc 180
 ttattttaat gataatgatg atcgtgatca taacaattat aatgaagata atattgggat 240
 tgacaaacac c 251

<210> 294
 <211> 564
 <212> DNA
 <213> *Candida albicans*

<400> 294
 aacagcaacc agaaatcaag ttaggtatga gaccattgtt gttggatttc ttaatggaag 60
 ttatcactat tctcaacttg tctagatcta cattcccttt gactgtcaat ttgattgatc 120
 gttattgttc aaccagaatt gtcaagaaac aacattacca gttgttgga ttgactagtc 180
 tttggatcag ttgtaagaac ttgattcaa agttcaaagt tcctacattg aatgatttga 240
 gaaaaatttg tggtgacagt tattacaaag aattgtttgt ggaaatggag aaacatattt 300
 taaaatcatt agaatgggtc gtcaatgtc cgacatttga tgcctttatt gatttgtatt 360
 caaacttgtt gatttctaac agcagtaact ttgaggtgtc aaacattatc aaaaaatcat 420
 ctcataaaat aaaattgttt tccaattata ttggtgaatt gttccagttt tatccaaaca 480
 tttattacga ttacacatcg tcacaaattg ctttgattgc tattttaatc acggtcttga 540

cgttgaagat tcctgttgat ttaa

564

<210> 295
<211> 580
<212> DNA
<213> *Candida albicans*

<400> 295
gctaccactt taaccgacac cggtgtatcc tcaggattga ataataccac ttctggtggc 60
ggcagtgata gtgcaacctc cacacacaac aacaatgagg catcgaccaa accaagtaat 120
ggcagtgaaa aatcgtcacc ggagtacact acaactgccc gcggtagaga tgagtttgga 180
ttccttaatg aagccacacc aagtcaatac aaagccaatt cagattatga agacgatttc 240
ccattggatt atatcaatca gaccactcaa aattctgaag attatattac tttggatgca 300
aattatcagg caggaagtta tgcaaataatg atcgaagaca attacgattc atttttggat 360
gcaacactat ttatacctcc aagtcttggc gtacctacag gtacagctgc gactgcaaca 420
acatcaaacc aagttgcctt caacgacgaa tacttgattg aacaagccca accaataagg 480
actccactac cccaatatc atcatcaaca atatccgat tattacaacc aaaatcagct 540
gctaaattct ttctactaca gagtgctaag ggtggagaag 580

<210> 296
<211> 604
<212> DNA
<213> *Candida albicans*

<400> 296
tttcatcacc acctcaagtc tctgtaacat catctgaagg agtttcacat gtcaatacac 60
gtcaatattt gggatgatgtt tcaaatacat acataacaaa tgctaaacca acaataaaaa 120
gaaaaccatt gggatggagac aatgcccctc taaaaaaca acagcataga ccatctagac 180
caatacccat tgccagtgat aacaacaata atggtagtac cagtagcagt agcaacagta 240
gcaacaacaa taacaacgac gcaaatagac tagcatcttt ggcagttcca tctcgattac 300
ccccaaaacg acaagctact gaatcgctga caaatttagt agagaaatta agagtaccac 360
aaccagaagt aggggaaaga agtcagtcac accataagaa atcacgttta attgattatg 420
aatggcagga tttggatgaa gaagataatg acgaccaatt aatggtagt gaatatgtta 480
acgaaatatt ttcgtactat tacgaattag aaacacgaat gttacctgat ccgcaatatc 540
ttttcaaaca aacattgtta aaaccaagaa tgagatcgat attggttgat tggcttgttg 600

aaat

604

<210> 297
 <211> 735
 <212> DNA
 <213> *Candida albicans*

<400> 297
 ccagcaaaca attcctaatac aattgtcaca gccacaacct cagcattaca atggatctaa 60
 tcgtaattac acaagtgtct ctagtgggtgc ccccatacct tccaattcta ccagtggacc 120
 ttcacaacag ccaccactac cagggtcaaca agcagtacct atcccaccac atgtatcgac 180
 aatgcaacaa ccaactcctg ttcaggatac gttgaacgcc tcgagcactt ccactgtggg 240
 gcaattccaa ccaccaggaa tcagaccacg agtaacaact accatgtggg aagatgaaaa 300
 aactttgtgc tatcaagttg atgccataa tgtgtcgggt gtcagaagag cagataataa 360
 tatgatcaac ggaaccaaata tgctcaatgt ggcccaaatg acacgtggta gaagagatgg 420
 gattttgaaa tcagaaaagg tgagacacgt tgtgaaaatc ggatcaatgc atttgaaagg 480
 agtctggatt ccatttgaaa gagcattggc catgggtcaa cgtgaacaaa ttgtggatat 540
 gttgtatcct ttgtttgtca gagatattaa acgagtgatt caaaccggag taactcctaa 600
 tgcagctgct gcaacggccg ccgccgctgc cactgccact tctgcttcgg ctctccacc 660
 tccacctcca cccgttgctg ctgctactac tactgtctgt actgctatct ccaaaagtgc 720
 tagcggtaat gggaa 735

<210> 298
 <211> 563
 <212> DNA
 <213> *Candida albicans*

<400> 298
 gtcgtttga ttagatttgg gatctttgcc cttgttttaa taggatgtgg ctatatcctt 60
 acaagaggct catcattcca acctccaaat tatcaacaaa cacaatcacc cgccgctcat 120
 gaaaaacaga ccggtaatgt tgctgctgga ggtggtgctg gttcagggtc cgcaggagct 180
 caagttccat taggcacaaa tagaggcca ataccaaaag caattatggg agctggtgaa 240
 ggtggtagt atgctccggt tcctcaacaa gatattcctg atagttatac cctcaatgac 300
 aaaattaagg ctacatttgt cactttggcc cgtaactctg atttatattc ttagctgaa 360
 tcaattagac acgttgaaga tcgtttcaat aagaaattcc attatgattg ggttttcctc 420

aatgatgaag aattcaatga tgaatttaaa gaaactgttg gtagtttagt tagtggtaac	480
actaaatttg gtttgattcc aaaggaacat tggtcatatc ctccatggat tgatcaagaa	540
aaagctgctt tagtccgtga aca	563

<210> 299
 <211> 554
 <212> DNA
 <213> Candida albicans

<400> 299	
cccaactaat tcagcatcac ttaaacagaa acaacgtcaa cagctaggaa ttaaattccga	60
gattggtgct tcaacatcag acgtatatga tccccaagtt gctagttatt tgagtgtggtg	120
tgattcacct agccaatttg ccaacactgc ctttcacatc agtaatagtgt ttggttattc	180
tgctagtgtgca gctgcagctg ctgcggaatt acaacaccgt gcagaattac aaagaaggca	240
acaacaattg caacaacaag aattacaaca tcaacaggaa cagttacaac aatatcgaca	300
ggctcaagca caggctcaag cccaggcgca agctcaaaga gaacaccaac agttacagca	360
tgcttatcaa cagcaacaac agctacacca attgggtcaa ctttctcaac agttggcaca	420
accacatttg tcacaacatg agcatgtcag agatgcgctc actacggatg aatttgatac	480
taatgaagat cttcgttcac gatacattga gaatgagatt gtaaagacat ttaacagtaa	540
agccgaattg gtac	554

<210> 300
 <211> 503
 <212> DNA
 <213> Candida albicans

<400> 300	
aacagcaagc tgctcagttg cagcaacaaa tgcaacagca attgcaagcc agtgggttgc	60
caacaacacc aaactattct gaattgttag gtcaattagg ccagttgtct caacaacaat	120
cacagcaaca gcagcttcat catatacctc aacaacgtca acgaaccag agtcaacaac	180
tgcaacagca acctcaacaa actgcacatg gattggatca accagatgct gcagttattg	240
ctgcaattga agctagtgtgca gcagcagctg ttgcgtctca aggatcacct aatgtcactg	300
cagctgctgt agccgcatca caacacacac agggtaatga gcacgatgct caacaacaac	360
aagatcgttg tggttaataac ggtggtgcta ttgattcaaa tgtcgatcca agtcttgacc	420
caaacgttga ccctaattgtt caagctcatg atcattctca tggattaaga aattcgtatg	480

ggaaaagaag tgggtttttg taa

503

<210> 301
 <211> 724
 <212> DNA
 <213> Candida albicans

<400> 301
 gtcctttcaa gtgtttgtgg agcaactgta acattatattt cgagactcca gaaattttgt 60
 acgatcattt gtgtgacgac catgttggtg gaaagtcttc gaacaatttg tcattgactt 120
 gtctttggga aaattgtggc acaactacag ttaagagaga tcacattact tctcacttga 180
 gagtccatgt cccattgaag cttttccatt gtgacttggtg tcccaaactg ttcaagagac 240
 ctcaagattt gaagaaacat tccaagactc acgctgaaga ccatccaaag aagttaaaaa 300
 aggcacaaag agagttgatg aaacaacaac aaaaagaggc caagcaacaa cagaaattgg 360
 ccaacaagcg agcaaaactcg atgaatgcaa ctaccgcac cgatttgcaa ttgaactact 420
 attccggtaa ccctgctgat ggattgaact acgacgacac ctccagaaaa agaagatacg 480
 aaaacaattc tcaacacaac atgtatgtgg ttaatagtat tttgaacgat ttcaacttcc 540
 aacaaatggc acaagctcca cagcaaccag gcgttggttg aaccgcagg ttctggetga 600
 gttcacccac caagaggatg aaagccggca ctgagtataa cattgatgtg tttacaagt 660
 tgaatcattt ggacgaccac ttgcaccacc accaccctca acagcaacac ccacaacaac 720
 aata 724

<210> 302
 <211> 543
 <212> DNA
 <213> Candida albicans

<400> 302
 ataaccaca taaggctctg ttaccaggag aagaaatctc aggacaagtt gtattaattt 60
 cgaaaaagaa tttggcaa atagtataa cgttgtcgtt ggtggggttt attaaaataa 120
 atgcatcgtc acatctgaag ttgaggcctt tgaagcatac gttatttgat tatactatta 180
 aaatctatgg taaagatgaa gaagaacaaa cagactcagc agagttagt aatggacttt 240
 tgaaaggcga acatgtgttt ccgtttattg taaagttgcc caataaaaga gtatatacgt 300
 cgattgattt tgggaaaggt tccatcaact acattttgaa agcagctata ggaaactcgt 360
 cgtcctatgt gatacctgcc tcgcccgcac atgccagtac tagcagttta acgaaaaaga 420

aaatactaca gaatcctagt cacacatcag aaaaagtcac aagtctagta aatccaatag	480
atgttttcgtt attgcctcga ccgaaaccaa agagattgat tctcaaagat ccacgaacta	540
gct	543

<210> 303
 <211> 315
 <212> DNA
 <213> Candida albicans

<400> 303	
tgactacgat gactactgaa gaaatattgg cttcttatcc acaaatcacc gctccaaccg	60
atcaaacagg ttacacatca aatttaacac ctgaacaaaa aaccacttta gatataattca	120
gacaacaatt aactgaattg gggtataaag acagattaga tgatgcatca cttttaagat	180
ttcttagagc aagaaaattt gatattcaaa aagctattga tatgtttgta gcttgtgaaa	240
aatggagaga agattttggt gttaatacca ttttaaaaga tttccattat gaagaaaaac	300
ccattgttgc taaaa	315

<210> 304
 <211> 230
 <212> DNA
 <213> Candida albicans

<400> 304	
attggtttca aacagttact cagcacgcca atgaggatgc acagatattt ttagtaggta	60
acaagtgtga tgatgaagta aacagacaag tttctaaaga gcaagggtcaa gaattagctg	120
ctaaattaaa tgttccattt ttggaagcca gtgccaaaag caatgaaaac gttgactcta	180
ttttttacga attggctagt attatccaag agaagcatgt tgaagagaat	230

<210> 305
 <211> 575
 <212> DNA
 <213> Candida albicans

<400> 305	
aaagagctaa ccacgtcaag gaaatcccac cattcttgca agatttagac attgccaaag	60
ccaaccccga gttcaagaaa cagcacctcg aatactatgt gttgtacaac ccacggttct	120
ccaaagactt ggatattgac atgggtccact ccttagacca ctcgtcagtt gtttgcgtcg	180
tgagattttc cagagacggc aagttcatcg ccaccggttg caacaaaacc acccaagtgt	240

tcaatgtcac caccggagag ttggtcgcca aattgattga cgagtcctcc aacgaaaaca 300
aagacgacaa caccaccgcc tcaggcgact tgtacatcag atctgtgtgt ttctcccctg 360
acggaaaact cttggcgaca ggtgcagaag acaagttgat tagaatctgg gatttgagca 420
caaagagaat tatcaaaatc ttgagggggc acgaacaaga catttactcg ttagactttt 480
tccctgatgg cgatagggtg gtttcaggct ccggcgatag gtcagtcaga atctgggact 540
tgagaacctc ccagtgttcc ttgactttgt cgatc 575

<210> 306
<211> 286
<212> DNA
<213> Candida albicans

<400> 306
aggtggtgtc atgaaattat tagttggtaa taaggctgat ttgtctgata aaaaaatcgt 60
cgaatatact gctgctaaag aatttgctga tgccttggaac attccatttt tagaaacctc 120
cgctttatca tcgaccaatg ttgaacaagc tttttacact atggcaagac aaatcaaagc 180
ccaaatgaca aacaatgcc aatgccgaaa tgctgccaat gccaaaggga aatctaattg 240
gaatttgaga ggtgaatctt tgacttctaa ccaatcgaat tcctgt 286

<210> 307
<211> 558
<212> DNA
<213> Candida albicans

<400> 307
ttgccaatc agcattacaa ttgcaacaa agacaacagg cacaaggaca acaactcaaa 60
ctgcaactaa acgagcaaaa tgccatgatg tctgcctcga ctcaacaata tcctgtccag 120
gattttacaa atccttacct caatgcacag aatcccgcag aacaacagca acagcaacaa 180
cctcttcgaa ccagtcaca acaatgggac ggctaccaat ctcaaccttt gtattctgct 240
gctggttaata ctataccatc ctcaatccag cagcaaatac caccacagaa tttgtctcca 300
tcagagcagc aacaagtcaa gcaacaacag ccactgccgc cagaacaagg aacaaagaaa 360
aaacctggta gaaaaccaa attaagaaaa ttatcggaac tgagttctga aacaccacaa 420
gttccaaaaa cagcatccag ttcttcgagc tcaccaactg cagtcaattc tggtaaacca 480
attacaaaaa gatcgcgat gggatgtctt acatgccgct aaagaaagaa acgttgttgt 540
gaaacaagac caaggtgt 558

<210> 308
 <211> 450
 <212> DNA
 <213> Enterococcus faecalis

<400> 308
 atatcgaagt ggtctattta gaggacttag ctgctgaagc gttgattaat gaagagggtcc 60
 gccgacaatt tattgaccaa ttcttagaag aagccaatat tcgcagcgaa tcagcaaaag 120
 aaaaagtttag agagttaatg ttagaaattg acgacaacga agaacttatt caaaaagcga 180
 ttgctggcat tcaaaaacaa gaattaccta aatatgagca agaattttta acagatatgg 240
 ttgaagcgga ttatccattc attattgatc caatgcctaa cttatacttc acgcgtgata 300
 actttgcgac aatggggcac gggatttctt taaatcatat gtattcagta actcgacaac 360
 gggaaaccat ttttgggcaa tacatttttg attatcatcc tcgttttgct ggaaaagagg 420
 ttcctagagt ctatgatcgt tcagaatcaa 450

<210> 309
 <211> 280
 <212> DNA
 <213> Enterococcus faecalis

<400> 309
 aattaaacaa agcaggaatc aagaaacaag tggctactgt ttaacacag gtggtcgtag 60
 atccagcaga tgaggcattc aaaaatccaa caaaaccgat cgggtccattt ttaacagaag 120
 ctgaagccaa agaagcaatg caagcaggtg ctatttttaa agaagatgca ggacgtggct 180
 ggcgcaaagt cgttccaagt cctaagccaa ttgacatcca cgaggetgag actattaata 240
 ccttaataaa aaatgatata attaccattt catgtggtgg 280

<210> 310
 <211> 600
 <212> DNA
 <213> Enterococcus faecalis

<400> 310
 agttgcacaa gtagcgatgg cgatggcttt taatcctcaa aaagattatt ttttaccgta 60
 ttatcgtgat atgaccgcgt gcttggtttg gggcatgacc tccaaagata ttttaatggg 120
 ttcttttga aaagaagcgg atccttcttc ccatggtcgt caaatgccga atcattatgg 180
 ttcaaaagag cataatattg tttccttctc ttcaacagta agtacacaaa tgccattagc 240
 aacaggtggt gggtatgcag cgcaacttca aaaagctgat tttgttgcgt tgaccaccac 300

tggggaaggc tctgccaatc aaggagaagt ccaagaagct attaactttg caggcgtaaa	360
aaaattacca gtcatttttg ttgttgaaaa taatgaatat gcgatttctg tcccaattga	420
agaacagtat gccataaac gaatggccga tcgcgcgaaa gcttatggct ttgaagggtg	480
gaccgttgat ggtagtgatt ttgctgaagt ctatctagca tttaaagaag cagtaaaagc	540
ggctcgcggg aaaaaaggac caaaattgat tgaattaatg gtttctcgct tgacttctca	600

<210> 311
 <211> 528
 <212> DNA
 <213> Enterococcus faecalis

<400> 311	
cgcagacaag aaagacaaca caacgaactc ttctagcgta gcattctcag aaacgaaaaa	60
atcaactgaa tcatcagcac cagcgaaaaa agttgccggt ggcgatttaa aagatggtac	120
gtataaatta gaagaaaaaa atgaaaaaaa tggttaccgt gcagtctttg aaatgactgt	180
aaaagacggc aaaatcactg aatctaata tgacaacatc aatgctgacg gcaaactctaa	240
aacagaagac actaagtatg aagaaagcat gaaagcaaaa tctggtgttg gaccaaaga	300
atacatcaaa caattaaacg attcttttgt taaagcacia agcgcaagcg gtgtggaagt	360
agtaactggt gcgactcatt catctgaatc attccaaaac tacgcacaac aattaatcca	420
agcagcacia gctggtaaca cagacacaat cgaaatcgac aatggggcaa cattgaaaga	480
tggtacgtac tcattgaaag aaaaaaatga ctcaaacggc taccacac	528

<210> 312
 <211> 451
 <212> DNA
 <213> Enterococcus faecalis

<400> 312	
ttttcacttt taggagctat ttttatttta gctagtgtg gcataaggaaa agatgctgtc	60
acagatacta agtacaaagt tagtttgacg caagctgctg aaatctatga aaaagaagct	120
ggcaacagca aaccattagt aaatgtccaa tttgatacag aaccagcaag tgactacagc	180
tatatcttta ctaacgatac agaaacactt tacgtgaatc ctgaaacagg aaaagtcacc	240
aaaaatactg aagcaaatca acttggcgaa aacgagacag ctttttcagc tgctgaagtc	300
aaagaattag gcgctgttaa cgacgtttta gccaaagcaa aaaaagaagt tggaggactt	360
tctccacgta ttttgacttg gaagttaacc aaaaataaca ataaacttgt ttatacagta	420

gatgttaaaa cgactacggc agatgaaaaa g 451

<210> 313
<211> 274
<212> DNA
<213> Enterococcus faecalis

<400> 313
caaaaccaac agaagaagaa ttaaaacaaa ccttgacgga tcttcaatat gccgtcacac 60
aagaaaacgc aacagaacgc cctttttcag gagaatatga tgacttttac caagacggaa 120
tctatgtaga cattgttagt ggcgagccgt tgtttagctc cctggacaaa tacgatgctg 180
gttggtggctg gccatccttt accaaaccaa ttgaaaaacg tggcgtcaaa gaaaaagctg 240
attttagtca cggcattgcac cgagtagaag ttcg 274

<210> 314
<211> 564
<212> DNA
<213> Enterococcus faecalis

<400> 314
ggcttagttg tcagttgtgg ggcctttttt gcccaacctt ctgtgactca cgcagaagaa 60
gatattaccg cgattgctaa aaaaatgggg acgactttga aagcggatgg cattcccaa 120
gcagccatcg ttgttgatgc tgattctgga gaaattctct ggtcgcagca accagattta 180
gcgtggaatc ctgccagtat tgccaaagtg atgaccatgt acttggcctt tgaagcaatg 240
gagcaaggaa aatttacaat ggatacgact gtgactgcta cgcaaaaaga tgtcgatatt 300
tctaaaatat atgccattag taataacaaa attacgttag gtgttgctta tccagtcctg 360
gaactgttaa aaatgattgc tgtcccctct tctaattgtg cgactctcat gttggcaaac 420
ttaatttcag ggaaccagcc tactgacttt gttcatthaa tgaatcaaaa agcggctgaa 480
ctagggatga caaatactac ctattacaac tgcagtggag cgcaagcaag tgcctttaac 540
ggcctgtatc aaatgcaagg aatt 564

<210> 315
<211> 478
<212> DNA
<213> Enterococcus faecalis

<400> 315
gtttgattgt tgcgagggtca aagaataatg ttataggcaa gaatggtaat ataccatgga 60

aaataaaggg agaacaaaag caatttagag agttaacaac gggtaatgtg gttattatgg 120
 ggcgaaagtc ttatgaagaa atcggtcacg cggtgcctaa tagaatgaat attggtgttt 180
 ccaccacaac agagtatcaa ggagataatt tagtttcagt taaatcatta gaagatgcat 240
 tattattggc taaaggacga gatgtataca tatctggtgg atatggacta ttttaaggaag 300
 ctttgcaaat agtagataaa atgtatatca cagaagtaga tttaaatatt gaagatggag 360
 atacattctt tccagaattt gatatcaatg attttgaagt tttgataggg gaaacacttg 420
 gtgaggaagt gaaatatacg agaacatttt atgtaaggaa aaatgaattg agtagatt 478

<210> 316
 <211> 380
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 316
 ttttactaaa ccattaggtg taaaattacc cccatttttt gatattgcac attttgacgc 60
 aatggctgaa attttaaata aattcccttt agtttacgtg aatagtatta atagcatcgg 120
 taatggttta tatattgaca gtgacaagga agaagtggtc attaaaccaa aaggaggctt 180
 cgggtggactg ggcggcgaat atgtcaaacc aacagcgta gccaatgttc gtgcgtttgc 240
 gcaacgtttg aaaccagaaa tcaaaattat tggaacgggc ggtattacat gtggaaaaga 300
 tgtttttgag catcttttat gtggtgcgac attagtacaa gttggcacac aattgcatca 360
 agaaggtcca caagtttttg 380

<210> 317
 <211> 537
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 317
 catgtattgg ttgttagata gggagtatga aaacttatat aatagtactt ataaagaaag 60
 tgcgcattta agagtcaaaa ttgcagacga tttgtcaaat ttaccattat cctatttttc 120
 aaaacataat ttatcagatt tatctcaaac tatcatgtct gacgttgaag gtattgagca 180
 tgcgatgagt catgcaatac ctaaaccggg tggataggct ctgtttttcc cttttatttc 240
 agtgatgctt ttggttggtg atgtcaaaat gggattagct gttattttgc caacgttatt 300
 tagttttgtc ttaatcttgt tatcaaagaa atcccaaagc aaagccaata ctaaataatta 360
 cgatactttg agagaaaact cggaagaatt tcaagaaact attgaattgc agcaagagat 420

taatagcttt aatctatcta aaaaagttca agacagactt ttcaaaaaaa tggaagagag 480
 tgaaaggatt catttaaagg tagaattaag tactttttca gtcatggcct taccctc 537

<210> 318
 <211> 606
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 318
 gatcaggaag atcaatcagg aaaaacacaa tggacaaagt attatctaac cgtttatatt 60
 tctggcttat ttaattttct gatgattctg attttatcag ttttatattg gacgttaagc 120
 gaaaccttta ttgtatacgt cgtactgatt tttttacggc ctgtcgcagg tggctggcat 180
 gcaaaaacta aatggctctg tcgtctagaa agcattgtta tctatgtcgc cataccattt 240
 gtattgaaaa attcttctgt gagcttaccg tttatttata aaattctatt gatttgcctc 300
 ttagtcgtat tattttattg gtatgcgcca caaggaacag caattgaacc tgttcagcca 360
 tctgatttaa acgtgctcaa aaagcaaagc cttataaggg tgtgtttact tattttatgt 420
 agtctgtttg tcaaagaaaa gattgcttca gtaatactct acggtctcgt catccaagg 480
 ctgatgatac tccctgtaac aaaaaattta attgaaggaa gtgtttttat gaaatttggt 540
 aaaaaataa ttaaaaatgt tattgaaaaa agagttgcaa aagtcagtga tgggtgtggga 600
 actaag 606

<210> 319
 <211> 507
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 319
 gttgggctac tcttggttga tttatgcgct gacagtcggt gtttttacag gatttttact 60
 cattcacaaa aagaggttct caatttttaa agcgatattt ttatccggtt ttacattgct 120
 tatggtttcg tttatcaatt acacggagca aacgatttta agtggttttt ttcaacagat 180
 ttatcaaaat aaattattat ggattgcctc aaatgttctt ctgttgctta taaatatctg 240
 gattgcttta aaaattccca atagtgtttt tttaagatta aatcgtgtgt tagaaaatag 300
 ccgaattttt tttggttggt tacttttatt gttgattctg ttgttacttt ttgtgttttt 360
 gatttcgcca gagatttcac ctgactttat gcgaggattt gtcacggtaa atagttctaa 420
 attggagtta ttaataagtg taggtttatt tttaattctg attggcttag tcattgaagc 480

ttatatttgaa gaacaacgta tcaacac 507

<210> 320
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 320
ttacgttaga agaagcatac caagagtcaa aacggatgca agaattggtc aatttttcac 60
caaataatca attgctctat aaaacagctg ttcagctaga aggattgcct cgccatgttt 120
ctacgcacgc agcagggtgtg gtaattagt atgaaaatct tttgaatttg gttccgttac 180
aaccaggatc gaatgaaatt ttattgaccc aattttactat gaatgatgtt gaaaaaattg 240
gtcttctgaa aatggatttc ttgggcttaa gaaatttata catcattgat gataccctca 300
cagctgttaa acgcgtctat aatcgaacca ttcgttttaa tcagattcca ttagatgacg 360
aaacaacgct ggctttatct agaaaagggg aaacaagtgg cgttttccag tttgaatctg 420
ctggaattcg gaatgtatta agaaaattag ggccaactag cattgaagat attgctgctg 480
tcaatgccct gtatcgtcct 500

<210> 321
<211> 407
<212> DNA
<213> Enterococcus faecalis

<400> 321
tttatgaagg cccaaagaat gatcttctgc taccttcaat tcaggctttt ttatcttaag 60
tgcctcaaga aataacgaat cggttttctt tttcattaaa aagacttttg agccttcctt 120
aaattctgag gaaaaaattt cgatgctttt ttcattgtag gttacttttt ctatctgaga 180
aagcggaggt gcttttttgc gaaaccacaa aacatctctg acaattaaag atgtttctgt 240
catattaaaa gaccgcgcaa ttcctagata agcaaacaca aaaaatggaa ccatcaccag 300
attactaatc aagtaaggac cattatcttc caatgctaaa attaaactaa taaataatat 360
acaaaatgtg caagaccagt aaataattgt tgatgctaatt tctggct 407

<210> 322
<211> 607
<212> DNA
<213> Enterococcus faecalis

<400> 322
tttacctcac cgaccaatcg cggcaacaat tgcattgtgcc tttaggcatt gttagtaatc 60

acgaagccga atttaaagtg ctgattgaag ctttaaaaca agcgattgcc aatgaagaca 120
atcaacaaac cgttcttctc cactcagata gtaaaattgt tgtccaaaca attgaaaaaa 180
actatgctaa aaatgaaaag taccagcctt atttagcaga atatcaacaa ctagaaaaga 240
atcttccttt gctcttaatc aaatggctac ctgaaagtca aaacaaagcg gccgatatgc 300
ttgcacggca agcattacaa aaattttatc ccaataaaaa gtagcactgt ttacttaatg 360
cttttccttt attaatgtga taattaaaca cgtggagcaa aaattccaag tgatttttgc 420
tccacgttta aaaacagata aacggttctg tctcgacttc ttcttatagc cacttattct 480
tttgcgtta tttccgcaa ttgccattg gtagcgaaa ggattgcttc aggcgctaata 540
tcaatttgca tgccacgttt gcctgcagaa acaataattg cagaatattg ttgagcttct 600
tcagcca 607

<210> 323
<211> 521
<212> DNA
<213> Enterococcus faecalis

<400> 323
tctgtttacg ttagcgggtct ttctacaagg aggcgttact gatttaaaca cgaatcaaat 60
tggacaagtg attcctaata gccagccgc agaagctggg ttgaaagaaa acgataaagt 120
cttatcgatt aataatcaaa aaatcaaaaa atacgaagat ttacaacca ttgtgcagaa 180
gaaccccgaa aagccgttaa cgctcgtagt tgagcgtaac ggcaaagaag agcaactaac 240
agtgcacca gaaaaacaaa aagtggaaaa acaacaatt ggtaaagtcg gcgtttatcc 300
ttatatgaaa accgatttac cgtcaaaatt gatgggcggg attcaggata ctttaaatag 360
tacgacacag atttttaaag cactcggtc actattcaca ggctttagtt taaacaaact 420
aggtgggcca gtcattgatg ttaaattatc ggaagaagca tccaatgctg gagtaagtac 480
agttgtattc ttaatggcca tgttgtcaat gaacttaggg a 521

<210> 324
<211> 531
<212> DNA
<213> Enterococcus faecalis

<400> 324
ggcgacgaag ttaaagtga taataacaa attgtttctg gactcgatgt ttcggcagct 60
tcggttagtg agatgatttc aaagttagta aaagaagatt tggttgagca ttctccttat 120

caaggggtac aattaactga aaaaggctta aaaaaagcga gtacgttaat tcgcaaacac 180
cgaatctggg aagtcttttt agtagagcac ttaaattaca cttggaatga tgtgcacgaa 240
gaggcagaag ttttagaaca tgttacttca cagacgcttg tgaaccgttt agcggattat 300
ttaaatacatc cagaattttg tccacacggt ggtgttattc ccgaagataa tcaaccatt 360
catgaggaga aacgccaaac gttaacagac taccctgttg gcacaaaaat tcggattgca 420
cgtgtcttag acgaaaaaga attactggat tatttagttt ccattgattt aaatattcaa 480
gaagaatata cgattaaaga aattgctgca tatgaaggac cgatcaccat t 531

<210> 325
<211> 342
<212> DNA
<213> Enterococcus faecalis

<400> 325
gatacgaaga agatagcgaa acggttcaag ataaagtcac agcgctgcca agtaccggtg 60
aatttgcttc tgacaacaga aaagcaaaaa gctgtgataa ggaacagAAC aagtcaaaga 120
aaatatggaa ccacgtgtag aataaacagt taaagggagg aaacaatcat gggctttatt 180
tgggcattaa ttgtcggcgg ggtcattggg gcaatcgctg gagcaattac taaaaaagga 240
tcatcaatgg cattattgca atatcattgc agggtaggtt ggttcaacaa ttggtcaagc 300
catttaggca catgggacaa gcttagctgg gatggctatt gt 342

<210> 326
<211> 512
<212> DNA
<213> Enterococcus faecalis

<400> 326
aagatggtag gtgtattcgt tttgacactc tttggcaagc aggtttgcaa gcttgttttg 60
aaacactaag tatgttagcc cctcatcatt cagcagaaat aaaaaagata ttagctattc 120
aggagcaacg ttttttgcaa aaacattttac ttgatgaagt cctttatcag gaactttatc 180
aggaattggc gcaatttgag gaattagtcg aacagggaat cagcagtcga tggctggagc 240
aattttttta tgattattta cgaaaaaatc tgaaaaagat cgaaccaatt ggtgatttaa 300
aacagttatt tcttgagcta aaacggaaga actataaaat tggattagca acttcagata 360
ctttgccagc gactatgttg attatggaat atcttggttt aacagaaatg tttgatttta 420
ttgcgacagg agatcgttac ttaccgaaac cagatgcgga catgctccaa gccttttgtc 480

agtcacgtca attgaaggcg acagaagtaa tt 512

<210> 327
<211> 643
<212> DNA
<213> Enterococcus faecalis

<400> 327
ttatttctgt tgagggcaaa gcggaagcag gtaaatactt gttcttcaca accttaaaag 60
gaaccgtcaa acggacagcc gtaacagcct tttctaatat ccgtagtaat ggattaatcg 120
ccattagctt aaaagaagat gatgagttag ttaacgtagt aacgactaat ggcaatcaga 180
agatgattat cggaacacat gcaggatact ctgtcacatt tgatgaaaat actgtacgtg 240
atatgggccc gacagcatca ggtgttcgtg gaatccgtct ccgcgaaaat gattatgtgg 300
tcggcgcagc gattctggat gaaaataaag aagtcctagt cattactgaa aatggttatg 360
gtaagcgtag aaaagcctct gaatatccag ttaaaggacg tggcggtaaa gggattaaga 420
cagcaaatat cactgagaaa aatgggtccat tagctggttt aaccacggtc aatgggtgatg 480
aagatatctt attgattacg aacaaaggcg tcattatccg ctttaacgtt gattctgttt 540
ctcaaacagg acgcgcaaca ttaggggttc gtttaatgag aatggaagat ggtgccaaag 600
tggtacaat ggctgttgta gaaccagaag aagtggaaga aga 643

<210> 328
<211> 402
<212> DNA
<213> Enterococcus faecalis

<400> 328
ttgatcgttt tgacgtaatg ataaaaaaag cgaagaaaac ctaccaacgc ctagacttag 60
aagaaaaggc cactctttta gaaggacaag cagctgagat tctaccaacg ttggaaggac 120
cttatgactt tatttttatg gatagtgcc aatcaaaata cattgaattt ttacctgaat 180
gtttacggtt gctgccagtt ggcggcgttt tgatgggtgga tgatgtattt caagctggga 240
caattttaga ccctgctgag gaagtaccga aaaaaaatcg agcaattcat cgtaaattaa 300
accaattttt agatgtagtc atggctcacc ctgatttaac ttctacttta gttcctcttg 360
gtgatggagt tattttaatt accaaagaga aagaaacgat ta 402

<210> 329
<211> 608

<212> DNA

<213> Enterococcus faecalis

<400> 329

agcgactaga gagcatataa gtaaacgaac gggcggtgcc ttgtgggtgg tgacggagtt	60
agccataatg gctacagata tcgctgaggt aattggtggt gccgttgctt tgcaattatt	120
atttggtttt ccattattaa ttggtgtggt gataacaacg tttgatgttt tattactggt	180
gctactgaca aagttaggct ttcgcaaaat cgaagcaatt gtttcttggt taattgcagt	240
catctttttt gtttttgctt atgaagtggc attagcagat ccaaattgtg gtgaagtatt	300
acgagggtttt attccagaca caaaaatagc gacagataaa tccatgttat ttttagcctt	360
ggggatcggt ggagcgacag tcatgcccc aacttatat ttgcattctt ccattgcgca	420
agcacggaaa tttgatcgta acgatgatgt tgagaaagcc aaagcaattc gtttcactac	480
ttgggattca aatattcaat taactgttgc tttcgtcgta aattgtttgt tgttaatttt	540
aggaggagca ttattttatg gaaccaacag tgaattaggt aaattgttg atttatttga	600
tgctctga	608

<210> 330

<211> 450

<212> DNA

<213> Enterococcus faecalis

<400> 330

aaattgttgc acgtatggaa aaaatgaaag acggaaattt aagtggatc caacgacata	60
atcaacgaga aaccaataat cattccaatc ctgatattga tattgagaaa tctcacttga	120
attatgactt agtcaatcct ggttcaatca attatcgga gaaaatcaaa caaatcattg	180
agagccaacg aatcagtaaa cgagcggtta gaaaagacgc agtccttggtg aacgaatgga	240
taatcactag tgataccgcc ttttttcaag agaatacaga cacacaagca ttttttaccg	300
atgttgctgc atatttctct gatcgctgcg gtcgacaaaa tgctgcctat gccacggtac	360
atttagacga aaccacgccc catatgcact taggaattgt gcctatgtac gaagggcgat	420
tgagcagtaa acaggtgttt agtcggcaaa	450

<210> 331

<211> 360

<212> DNA

<213> Enterococcus faecalis

<400> 331

caatggaaca aaggccactc tgatgaaacg tcgtttgctg aaaatattcc agctaataat 60
 tgggaaaacg aattggccat gctctttatc ttaattaatg atggcgaaaa agatgtttcc 120
 agccgtgatg gaatgaaacg aacagtagaa acttctagct tttatcaagg ttggttgac 180
 aatgtggaaa aagattttatc ccaagttcat gaagcaatta aaacaaaaga cttccctcgt 240
 ttaggagaaa tcattgaagc caatgggtta aggatgcatg gaaccacctt aggcgctgtc 300
 cctccattta cttactggtc cccaggcagc ttacaagcga tggctttagt tcgccaagca 360

<210> 332
 <211> 526
 <212> DNA
 <213> Enterococcus faecalis

<400> 332
 ctgcggttaa agtcgttgca ttttctaaaa gggaaatgag tcccagataa agtgaaccgc 60
 tatacaagtt tcctacgga cgactataga tgatgctttc ttcataacgg gctaaaattc 120
 gttcctgttc tgcttcagtt tggtcggaga tttttgctaa taaggctttt ttgcccattt 180
 ttgtgtaagg aatatggaac gctaaagcat cataatctgc aaaatcaaga ccggttcttt 240
 ttttatgttc atcccagact tgggcaaaag attggatgta ggtttcgttt gacaaaggac 300
 catcgaccat aggatacggg tggcctgttg gacgcaaaa gtcatagata tcttgcgtca 360
 gcatcacatt atcctctttt aaagccaaga tgcgcggttc actagcaact aacattgcaa 420
 ccgccccagc tccttggtga ggctcaccgc cagaatttaa tccatatttt gcaatatctg 480
 ctgctacaac caagactttt ttatctggat gtaaggctac gtgatt 526

<210> 333
 <211> 512
 <212> DNA
 <213> Enterococcus faecalis

<400> 333
 atccgactat gcgtttactg aagaacaagc tgaagcaatc gttactttac agctataaccg 60
 tttaaccaat acggatatta ctgatttaca agaagaagcg aaaactttag aacaacaaat 120
 tgctgagtta ttgaacattt taaacaatga aaaagaacta ttctcagtca tgaaaaaga 180
 acttcgcgaa gttaaaaagc aatatggcaa tccgcgctta actcaaattg aagaggaaat 240
 ccaagaaatc aagattgaaa cagccgtgtt agttgcgcag gaagacgtgg tcgtaaccgt 300
 gacgcacgaa ggctatatca agcggagtag tattcgttct tatacagcat caaaaccaga 360

agaaatcggc atgaaagaag gcgacttttt attatatgct ggcgaagtca atacattaga 420
 tcatctttta ctagtaacaa ataaaggga tatgatctat cgccccgtcc atgagttgcc 480
 agatttacgc tggaaagaaa ttggcgaaca ta 512

<210> 334
 <211> 604
 <212> DNA
 <213> Enterococcus faecalis

<400> 334
 aggatcaatc gtaaattggtg tatacaaac attttggtat tcatacatTT gataaattaa 60
 acaatgcctg ctcgtatatt gagaatgcag aaaaaactga agtcacgaat gataatccgt 120
 ctgaacactt ggaacattta tttcaatata ttgtgaatga cgataagaca tacatgaaaa 180
 aattagtttc tgggtcatggc attgtggatc caacaaatcc ttatgaagaa tttaaattaa 240
 caaaattaca agcagcaatt caacgaaaaa tcgggtacac attcgatcca aaatcagaac 300
 gattgcttcc gccaacgtta acagaattag aaaaaggcaa cgccgtttta gcacaccatt 360
 taatccaatc attttctcca gaagatgatt taacgccaga aaaaatacat gaaatagggt 420
 acaacacggt gatggaattg acaggtggaa agtataaatt tgtgatcgcc acacatgtcg 480
 acaaagaaca ttacacaat catattatTT ttagttcaac caacttaaaa acaggtaaag 540
 cctttcgctg gcaaaaagga accaaaagag tctttgaaca aatttcggat aagattgcag 600
 cgaa 604

<210> 335
 <211> 451
 <212> DNA
 <213> Enterococcus faecalis

<400> 335
 aagatggtga aacattggtg gttacaactg cagatcatTC aacaggtggc ttgtcttttag 60
 gcaaaggaga tcaatacaac tggttgacgg agcctttaca tgcggcaaaa cgcacgcctg 120
 atttcatggc agaagaaatt attaaaaatg gtaatgtgga aaaaacagtg actgagtata 180
 ttgattttca attaagtgag gctgaattga aagcagtga aacagcggcg gagtcaaaag 240
 atgttgaaaa aatcgctcag gcattaagaa agatttttga tgaacgttcg aatactgggt 300
 ggactactgg cggacacaca ggagaagatg taaatgtcta tgcttatggc ccacaagcag 360
 aagctttttc aggacaaaatt gataatacag accaagcgaa gattatTTTT ggcttagtag 420

atggcaccgg gcaaaaagct gagattaaag a

451

<210> 336
 <211> 543
 <212> DNA
 <213> Enterococcus faecalis

<400> 336
 gtttccgttc aaataaccac aaatcagaca acatttacag aggaacaatt aacggattat 60
 tggcagttgg ccttgttaaa tagtcagtgc aatacaccgt tagttcagaa agtcctaaaa 120
 acacagacac cacaatttga agatcggaaa attatcttac ctgttgataa tgaagcagtt 180
 attccttata tgaagcaaca atatttacca attattgagg aactttatct ctcttatggg 240
 tttcctaaat ttcattattga accaaaaatg gatcaacagc aagctgcaga agtggtgaaa 300
 aagtttgaag agcaaaaatt agaacaagcc gcagcctttc aacaacaagc tgctgaatcg 360
 cttgttaaac atgaacaaat gaaaaaagaa aaacaacaac aagcgcctgc gtttgatggt 420
 ccaattcgtt taggtcggaa tattccaat gatgaacca ttatgcccac gggaaatata 480
 ctggaagaag aacgtcgtat aacgattgaa ggctttatct ttgataaaga agtgcgtgaa 540
 ttg 543

<210> 337
 <211> 578
 <212> DNA
 <213> Enterococcus faecalis

<400> 337
 aattgcagga gggtcacac cagagatctt acagctagtt aaaaaagcac taaaagaagc 60
 cgagcaaccg ttgcagttta ttgtatttga tacaatatga aatcttgata ctgaaaatct 120
 ctggaaatat gttcattgct cagatgaggg cgcggttagc caggaaagctg tcagtttagt 180
 tgcaaccggg caagcacaaa ttttattgaa aggaattatt cagaccaca cattactaaa 240
 agaaatggtg aaaagtgagc atcaattaaa aaataaaccg attctttccc atgtagcaat 300
 ggtggagctg cctgcgggaa aaaccttctt gttaaccgat tgtgcgatga atatcgcccc 360
 cactcaagcg accctcattg aaattgttga aaatgctaaa gaagtcgccc aaaaattggg 420
 actgcaccac ccgaaaattg ctttgtttaag cgcagcggaa aatttcaatc ctaaaatgcc 480
 ttctgtctgt ttagcaaaag aagtcacggc acattttaat aatcaacaag aggctacggg 540
 ttttgggccc ctttcgcttg atttagcgac ctctgaag 578

<210> 338
<211> 320
<212> DNA
<213> *Enterococcus faecalis*

<400> 338
aatgcgtgat caggggtgat gataaaactc ttggaaagag gcagaat ttt gaaagttgca 60
tatgcaagag tttcatccat tggcaaaact tggaacggca aattcaagag ttaaaaaaat 120
taggagcgaa aaaaatattt gtagagaaaa aatctggcgc aagtattgaa caacgactaa 180
tttttacaga agctatctat tttgtgagag aatccgatat ttttatggta gaagccattg 240
accgattagg cagaaattac gatgaaatta ttcagacggt taattttattg aaaaataaaa 300
atgttcgact cataattaca 320

<210> 339
<211> 693
<212> DNA
<213> *Enterococcus faecalis*

<400> 339
ctcaacagct tcaacaatcc attcaaattt tacaatttaa tacggaagaa ctggctgcct 60
ttgttgaagc gaaagcacta gagaatccat taattgattt acaagtagac acgcagtaca 120
ccacagattt tccgataact agtcgttctt acaccaacca agacgaagaa aataattata 180
tgaatcaaat tccagactat catttatcat tatttgagtc ttttaattgat caaattcatt 240
tgaattaccg cgatacatat ttgcgaacat tggatttggc ttttagtagaa tatatagacg 300
tgaattggta tttaaagatt tcgttagaag aagcggcaga gaaaaccgaa gcaagcgcca 360
ttcaaatgct agatgcatta actttgttac aacagctaga tccagcaggt gtgggggcac 420
gcaatttaca agaattgttg atgctacaaa cagaacgaga cgataccgag cctaacttag 480
cgtatat tttt attggaggaa gagtttgatg ccttagtgag tcgtaaattg ggcccgttag 540
ctaaaaaatt cgggattgaa ttagcagaaa ttcaattgat ttttgattat atacaaacgt 600
tatcgccagc gccagggaat atttttgatg cgaccgagga attgtatatt cgaccagatt 660
taactgtccg aatcaaggaa gatcgaatag tgg 693

<210> 340
<211> 210
<212> DNA
<213> *Enterococcus faecalis*

<400> 340
 aggttttagaa gtgggggagt ttgtacacac gctaggagat gcccaattat atcaaaatca 60
 tgttgaacaa atgcaagaac aattatcacg agaagtctgt tctttcccaa cgctcgtttt 120
 gaatccagac aaggcttctg tttttgattt tgatatggaa gatattaaag tagaaggcta 180
 tgacccacat ccaacgatta aagcgccgat 210

<210> 341
 <211> 504
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 341
 aacgcacatc tgaaagctac gaaaaaactg tcaaccatat gaaagatgta ttgaatgaaa 60
 tctcttctcg catgcgtaca cattcagttc catggcatac agcaggtaga tattggggac 120
 atatgaactc agaaacatta atgccttctc tattagctta caactttgca atgctatgga 180
 acgggaacaa cgttgcctat gaatcttctc cagcaacttc tcaaatggaa gaagaagtag 240
 gacatgaatt tgctcacttg atgagctaca aaaatgggtg gggacacatc gttgctgatg 300
 gttcttttagc taacttagaa ggcttatggg atgcccgtaa cattaaatca ttaccatttg 360
 ctatgaaaga agtaaaacca gaattagttg ctggcaaatac agattgggaa ctattgaaca 420
 tgccaacaaa agaaattatg gacttattag aatcagctga agatgaaatt gatgaaatca 480
 aagctcattc agctcgttca ggta 504

<210> 342
 <211> 400
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 342
 atggaggggtg ataacatgaa tatcattgac gagctagcat ggcgtgatgc aatcaatcaa 60
 caaacaaacg aagaaggact aagagaactt acagaaaata cgagcatttc gctatattgc 120
 ggtgtcgatc caactggaga tagcatgcat attggacatt taattccttt tatgatgatg 180
 aaacgattcc aattagcagg tcatcaccca tacattttta ttggtggcgg aactggaaca 240
 attggtgacc caagtggacg aacaactgaa cgtgttttac aaacgatgga agctgtgcaa 300
 cataatgtgg acagtctttc aaaccaaatag aaaaaattat ttggtaaaga tgctgaggta 360
 acaatgggtga acaactacga ttggttatca gaactatctt 400

<210> 343
<211> 585
<212> DNA
<213> *Enterococcus faecalis*

<400> 343
caggaggaac attggttggt cttcacaaaa atcaaccagt aactattacc tatggcaatt 60
tgaatgctag ttatttgggt aaaaaaattg ctagtgctga attccaatat acagtgaagg 120
ccacacctga ttcaaaaggt cgattgaatg ctttcttaca tgatgatcca gtggccacaa 180
ttgtctatgg aattaacatt gaccctcgta caaagaaggc tgggtgctgag attgaaatgc 240
tcgttcgctt ctttggagaa gatggcaaag aaatcttgcc aacgaaagag aatccatttg 300
tattttcagg tgcttcatta aattcacgtg gtgaaaacat tacgtatgag ttcgtaaaag 360
taggaaacac ggatactggt catgaaatta atggatcaaa agtagctcgt catggaaata 420
aagtttatcc taaaacggat attgatgtag ggacgaatgg gatttcaata agtgactggg 480
aagcagttca aggcaaagaa tatattggcg caactgttat ttcaacacca aatagaatta 540
aattcacttt cgggaatgaa attgttaaca atccagggtg tgacg 585

<210> 344
<211> 544
<212> DNA
<213> *Enterococcus faecalis*

<400> 344
cgacagaact tgctaaagta gatccaaaaa cggtaacaaa acaagggatt cgagatacct 60
ttgatgcaga aaaagtgacg attgatattat ccaaagtga agtttatcaa gcagacgcaa 120
gtctaaacga gaaagactta aaagctgttg ctgcagcgat taattcagga aaagccaaag 180
acgtgaccgc ttcttatgat cttaatttag accaaaacac cgtcacagca atgatgaaaa 240
ccaacgcaga cggctccggt gtttttagcaa tggggtataa atatttactt gtcttgccgt 300
ttgtagtga aaatgtagaa ggcgattttg aaaatacagc tgttcagctg acaaacgatg 360
gtgaaacggg acaaaatata gtgattaacc atgtgccagg tagtaatcct tccaaagatg 420
taaaagcaga taaaacggg acagttggca gtgtttctct acatgataaa gatattccgt 480
tacaacaaaa aatttattat gaagtgaat cttccgaacg tccagccaac tatggcggaa 540
tcac 544

<210> 345
<211> 341

<212> DNA

<213> Enterococcus faecalis

<400> 345

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cttctttcgt gctttcaacc acaatagatt gctctttatc agccaacagc caatggagag      60
gggataacg g aagttcatca ctaaaattaa tatttactaa attaagattc ttcaataaatt      120
tttttgcttc atctacagta gagcattggc ccaataccca aggaataaac tcaaatggag      180
aaacattttc ttttccttct tcaatttttt tataatctgc atagcctgaa aagtttaatc      240
cagccattcc taatcctttt tcatttattg catcataata aagcggataa tcagcaatcc      300
cagcagcaat tccaattatt gcaaaatgat gatctaaatt t                          341

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<210> 346

<211> 594

<212> DNA

<213> Enterococcus faecalis

<400> 346

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aaacctggat gatagtgata ggaagtttat aggtaaatat tttaatgttt cggaagggaa      60
aaaattacca gatttttaaac ctgaagaagt taatagttct attttaaaaca ttaatatattt      120
aaacaaagat tttaagtctt ttaattggcc atataaaaaa attttatctc atattgatcc      180
agtgaagaa caactaggga aagatataac catagctcta attgactcgg ggattgatag      240
gcttcactct aatcttcaag acaataacct aagattaaaa aaccatgtta atgatattga      300
gttagatgaa tatggtcatt gtacacaagt tgctggagta atagacacga ttgctccaag      360
agtaaattta aattcttata aggtgatgga tgggacagat ggaaactcta taaatatgct      420
taaagctata gttgatgcta caaatgatca agtagatata ataaatgtga gtcttggatc      480
atataaaaat atggaaatag acgacgaaag atttactgta gaagcattca gaaaagctgt      540
taactatgca agaaaaaata acattctaatt tgttgcattc gcaggaaatg agtc          594

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<210> 347

<211> 504

<212> DNA

<213> Enterococcus faecalis

<400> 347

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caaggagagc atagtgaatg tgctttggca tgtatcacta tgctacttaa ttattatggt      60
aatcaaagta cactagtaga actaaggga aaatatgggg tgcccaaagg aggactaact      120
atcaagaata ttcgtactgt ctttgacgaa tatggatttg atgtatcgac atttaaatca      180

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agtttttcaa attatttaga tcttccgact cctgtaataa gttattggaa taatcaacat 240
 tttgtggtca tagagaaaat aaaaaagaag aaagtattaa tcttagatcc tgcaagtaat 300
 aaacgctgga ttgatatttc agaattcaaa aaaaattttt caaatatatt aatatacgca 360
 cataagaaaa agactaaaaa agaaggcaaa aggaaacagt tttttttaa gtcatttatt 420
 tttacaaaat tcaaaagata tttctttagt ttaataatat tatcatttgt ttcacaactt 480
 ttattactct taattcctat tgca 504

<210> 348
 <211> 562
 <212> DNA
 <213> Enterococcus faecalis

<400> 348
 gttagggcac ttagcttttg gattatttaa taaagttaga ccagagtcac taatatttgg 60
 gtttataaaa ttttcgtggg aaaatcagtt taagatcaga ttaaatacac agtggggatt 120
 ttttggtgga ttatttagat ataaaccaac tacgtttaat aataagaaaa ttctgagggt 180
 gttaaccggg ggaccaatat ttagctttt ttttacatta accttttttg taaaaattga 240
 cttttttcaa tatttttctt tatttaattt ttcgatattt ttaattactg cagttccttt 300
 taattttaac gggtttatga atgatggata caatatatat aaattagtta ctaaggatta 360
 tatttttgaa atgtattata ttgtatcaaa tagcttactt aataaatata atcagtcaac 420
 tttcttaaat acaactgagg tatgcaaaat aataaaaaaa aataaagaat taccattata 480
 tgtgctaaat acattcttat tgtatgttat atatgagtat ttaatagaca aaaataatag 540
 gaaattaaaa ctaatatacc ca 562

<210> 349
 <211> 402
 <212> DNA
 <213> Enterococcus faecalis

<400> 349
 tggaataatt aagtgtagtt cctagttttg aagaactaag tgttgaggaa atggaagcga 60
 ttcaaggtag tggagatggt caggctgaga caacaccggt gtgtgctggt gcg'gcgacag 120
 ctgcagcaag tagtgctgct tgtggctggg ttggtggcgg tatttttact ggagtaactg 180
 tagttgtgtc tttaaaacat tggtaaaata tactataaaa cttagtggag tgaagcacag 240
 tgctaaataa ggaaaatcaa gaaaactatt actctaataa attagaactt gttggtcctt 300

cttttgaaga gttaagttaa gaagaaatgg aagcgattca aggtagtga gatgttcagg 360
 ctgagacaac tccagcatgt tttaccatag gcttaggagt ag 402

<210> 350
 <211> 562
 <212> DNA
 <213> Enterococcus faecalis

<400> 350
 agcaaagtgg taacgagaag tacgacatta aaaatttaca agcttggaag gaaagaaaaa 60
 gtgttcttaa acaagatgat ttagactact tgattaaata taaatatgaa tcaactggata 120
 attttggatt aggaataaca cctattgaaa actttcctga taaagaagtt gcaattcaat 180
 acattaaaga tcaatcatgg tatatttttt ttgaatccat tttagattct tataatgata 240
 gtgaagagca attattagaa gtagatgcta gttatccttt tagatatttc ttacagtatg 300
 ctcgtttatt tttacttgat ttaaaactcag agttaaatat ttgtacaaaa gaattcatta 360
 ttaatttatt agaaattcta acacaagagc ttattcactt aacaagtaaa acattagtgc 420
 tagatttgca tactttttaa aaaaatgaac ctctaaaggg aaatgatagt agcaagcgat 480
 ttatctatta tctaaaaaaa agatttaact ctaaaaaaga tataatagct ttttatacat 540
 gctatcctga gttgatgcgt at 562

<210> 351
 <211> 590
 <212> DNA
 <213> Enterococcus faecalis

<400> 351
 tagttggaat gaccgagaac gatggctcac cacgaaaaat caatttaaag ggtttagggg 60
 aagtttttat ctataaagat catgttgtag caacatttaa tgaaaaagtt gaatctttac 120
 ataatgtgaa tgggcatttt tctttcggga ttaaaacgct tatcaccaat agttcgcaac 180
 cgaatgtgat agaaacggat ttcggaacag caacggcgac tcaacgtttg acgattgaag 240
 gagtgacca caacagagact ggccaaattg agcgagacta tccgtttttt tataaagtag 300
 gcgatttggc tggagagtca aatcaagtac gttgggtttt aaatgtgaac ctcaataaat 360
 ccgatgtcac agaagatatt tcaattgcgg atcgacaagg aagtgtgcaa caattaaata 420
 aagagagttt tacatttgat attgtgaatg acaagaaac taaatatatt tcaactgccc 480
 agtttgagca acaaggttat ggcaaaattg acttcgtaac agataatgac ttttaatttac 540

gtttttatcg ggataaagca cgctttactt cctttatcgt ccggttacact 590

<210> 352
 <211> 648
 <212> DNA
 <213> Enterococcus faecalis

<400> 352
 tcaacgtcac aaacaagaac ctgatatctg tgaaaatgca aatcaattga atgaagctgt 60
 aaagcccaaa accggaaaacg aaaacaaaca accaaaaata ccgaagaaaa aatctaatta 120
 tagcaagtat atattcgcac tgtttaccgc acttattcta gtaattgtcg ctactggcgg 180
 ctatatgttt tatacattaa aacagcaaga agtagaagct caagccaaat atgaaactgc 240
 tgtaaaaaat ctcatggctt caatccaaga agagcaagac caaagtggaa tttcaacgaa 300
 aatagatact ataaatgacg gagaaaataa gtgccttatt taccgtccag tttatgaaag 360
 tactgttcct tttaaaaatg caaaccagct cttagacgag cttgctcaaa agcaacaaaa 420
 gaagcatcgt gaaaaagaag tgcttacagt tgccagaata aaagcaacag caatatcttc 480
 taaaattggt cagtatagaa ttgaagcaga tagttttatc tgggatcgca gtaaggaaaa 540
 ttttaaaaag ccagacagta tttctgagaa agccatttat gtttccgaaa aaactggtaa 600
 agaaatcaca aataaggatt tgattccgga tgaagggaagt ctcttagg 648

<210> 353
 <211> 520
 <212> DNA
 <213> Enterococcus faecalis

<400> 353
 tcggaagtat tgcgtttggt gggacaacat tagcttacgc tgatgaagtg cataatagta 60
 taaatcagga tatacaagat tctggtagta caattattgg agaaaatgat tcttctacca 120
 aatcagctga gtataaaatg attcatgaaa ttgatggaac taaaattagt aacggtgaaa 180
 atagtaaaga aacaactaca agttcaggaa ctatactggc tgaagaagca atagaaagtt 240
 caaatcaaaa aaattcaaag acaagtgaag tcgaacagga tcttcataaa gatgtatcag 300
 gatctgaatc agtaaaacaa gtagaaactt ctgattctat aaaaaaatct gaagaatcag 360
 ctgttaaaac attaaatctg gatgattcac aagagaatac taattcaata actaccaagg 420
 cagaaaatga tgcgctatct acagttaatg atgaaaaagt attaaatgaa agtgatagta 480
 ttatcaaatc aattccttcg gaaacagaga atgtcgataa 520

<210> 354
 <211> 668
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 354
 ttgtctttgg gcttctctct ttttcttgc ctatatTTTT agtctttgga ggcttacttt 60
 ttttcttttt attattaacg agtacgtcag atacttcaaa aaatgattgt attcagccaa 120
 gtataaataa tccaactgat gcgacagata cacctaaatc gatcgagcag tttgtaaaaa 180
 gccataaaga tgcttacctt ttatcatgga aagcaggtgg ctttttaccg tctgctagta 240
 tttctcaaac gatggttagaa aatgggttta attttactaa tccatcgggg acgtcatttt 300
 ggcaggcaca caatatgggc ggtgttaaaa cgtcaaaaaa agaagatttt cctgtaactt 360
 tagcaacatt cggccaagat tctgttgata tttctggtac aaagccaggg tcaaacgtcg 420
 gtgatggcac tgggtgggca tatacctggg ttaaagacta caatgctgga attggttgaa 480
 aagcagaatt tatggcacac cagacactgt atacaggtgc tatcaataat actgacggat 540
 taagtacttt atcagctatt tattcaggag gatgggctac agaccctact tacctcatga 600
 agttacaggc cacatataat agcttaggca agcagtttca atggttggac caagaagcaa 660
 tacagaaa 668

<210> 355
 <211> 517
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 355
 ctatagattc cctatcttgt tggtaaaaag ataaataaag aaatatTTTT tttcgataga 60
 atacgttaaa atatgaatag atatagatag taattatatt atctataaat agtagagtat 120
 aacgatcttt tatttttgga ttttctataa attttaagta gtaagaaaat ctttttcggt 180
 caaacttttc tataatctct aaatttttaa tttgaacaga attagttgaa ataagcatat 240
 aaaaatttaa tagtaattgc tccttatcag attttagacg tactctttca attatatcca 300
 tgatatattc atcgatggta gagcttttat cagcaatttt ttctaattca gagtttatta 360
 tatccaaatt atacacaatc actgcctcat ataaatcatg ttttgtttta aaaaagctat 420
 atacggtagt agtgcgtggt ttagcttcat tagcaatato taaaagtttt gttttttcat 480
 aaccaaattt agaaaagtgt ttcattgcgg taaatat 517

<210> 356
<211> 380
<212> DNA
<213> *Enterococcus faecalis*

<400> 356
atgtatgtat cttttgttct aagttgtttg cttggatttt ctgcctacag tctattaaat 60
aggctaaatt cgttgaatt tgtggatggt tggtagaca aagaaacaca aaaaatcaca 120
ctaaaacgct gtttttatga tacgtctttc aagaaacaaa cactaaaaga gttagaacga 180
gtatatttcc aattaaaaga aataatcaac gtgcaaataa acaagcggtc tttaaatacg 240
aatgacatac gtaatgtacg agaactagag gaaaaacaac aagaaataaa acgattcatg 300
ttagacgttt tagaagatgc ttattggaaa gaattagcaa atatgccaga agaccaacga 360
cacttagacg attgggattt 380

<210> 357
<211> 320
<212> DNA
<213> *Enterococcus faecalis*

<400> 357
aaagtactac cttttattgc cttagtcggc ttgttattgt tgtcagggtg tggaacagat 60
atgaaaaaga tattgactgc cgatggtggt aaatggaaag tggaagaaac acgtgcaact 120
tacacttttt ttgatgacgg taaattttca gctaactgact cagaggatag tgtagtgagg 180
acatacactt atgatgaaaa aaataaaaaa ataacctttg acattactag cagaaactct 240
ttcattatgg aaaaagtaga atacaaagat aacaagatta caggggaaat tggcgaaaaa 300
caaagaacac ttataaaaca 320

<210> 358
<211> 503
<212> DNA
<213> *Enterococcus faecalis*

<400> 358
tgaacaaaaa gcacaggata gtgtaaaaga agttactgaa aatgttactc aaactatttc 60
aaacgatcaa cgtataccag ctgattttgt taggcacgtg gatggcgata ccacagtatt 120
aaaaattgac ggaaaagaac aaaaagttcg gtttttatta attgacacac ccgagactgt 180
gaaaccgaaa acaaaagtgc agccgttcgg attggaagct agcaaacgca caaaagagct 240
tttgtctact gtttcagaaa ttacgtttga atatgataag ggcgataaaa cagatcgтта 300

cggacgagcg ttgggctaca ttttcgtaga tggaacatta ctacaaaaaa cgcttgtaag 360
tgaaggatta gctcgtgttg cctatgtaaa agagcctaca actaagtatt tggcagaact 420
agagcaagcc caagaacagg ctaaaaatga gtcactcgga atctggagca taccaggtta 480
tgtgacacaa cgggggttta gta 503

<210> 359
<211> 220
<212> DNA
<213> Enterococcus faecalis

<400> 359
tgatgaaaat ttaaaagaag aagcagaaca attatttgat gatttagggg taaatatgac 60
aagtgcatt acgattttct taaaacagtc tattaatgag caagcaattc cttttatgat 120
taataaggga acaaaagaga ctctacaagc attaaaagac attaaagaag gaaatgttca 180
tggtggattt tcttccgtgg aggatttaat ggaggattta 220

<210> 360
<211> 380
<212> DNA
<213> Enterococcus faecalis

<400> 360
tcaaatcac gtaagccttc tttcgtgctt tcaaccacaa tagattgctc tttatcagcc 60
aacagccaat ggagagggga taacggaagt tcatcactaa aattaatatt tactaaatta 120
agattcttca ataatttttt tgcttcatct acagtagagc attggcccaa tacccaagga 180
ataaactcaa atggagaaac attttctttt ctttcttcaa tttttttata atctgcatag 240
cctgaaaagt ttaatccagc cattccta atctttttcat ttattgcatc ataataaagc 300
ggataatcag caatcccagc agcaattcca attattgcaa aatgatgac taaatttcca 360
acttctcgaa atgaaaactt 380

<210> 361
<211> 511
<212> DNA
<213> Enterococcus faecalis

<400> 361
cattattttc attaggggat attagagata ttcttctcct tataaattat ttttttacgg 60
gaaagattga agacttattt cataagccgt tacatgatta tgagaaaaaa ttttcagaag 120

atatccaaat agaacggata gatatgttat tatctcaaaa ttatgatcca gaaatttatt 180
 tattttttata tgaaaataaa attttagaat atgttgtaaa tggtaatgta caagaattaa 240
 gtaatatgat atttaaaacta agtaatggtg ttgttcctgt ggtagtaggg gataacgtac 300
 gttctgaaaa gaattattca atagttgtat ttgagaagtt agcacaagca gctataaata 360
 tgggaatgga cttaataaat gcatatcaga gtcgagatag ttttataagg aaaaatgaac 420
 tatgtataaa tttaaaagaa gtattaaaag ttagagatac tgctatagta ttttatacct 480
 ctgaaatagg aaaagctaaa gtaaggaatc t 511

<210> 362
 <211> 526
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 362
 ttgcgatttc tgtttagtagga accattatctt ttgtaatagg actttatggt agtaaaataa 60
 aaaaataaat cacaattaag gttctggttg ttattaatct atctcatgaa gcattagatg 120
 aattagttct agaagtacct gttgtactag ttaaaaatac tgttaaatca aattttttgt 180
 ttaaaaagaat cattaagttg gtgcctaact ataaaatcaa attgactaaa atccaataac 240
 attgggggat actctgtaaa tcgtgtgtcg cagtacgtta gtcttgtaat aaatagatct 300
 taattaggag ggggtttctat gaaaaatatt ttactttcta ttctaggggt attatctatc 360
 gttgtttctt tggcgttttc ttcttattct gtcaacgcag cttctaataa gtggtcgtgg 420
 ccactgggca aaccatatgc gggaagatat gaagaaggac aacaattcgg gaacactgca 480
 ttaaacgag gaggtactta tttccatgat gggtttgact ttggtt 526

<210> 363
 <211> 505
 <212> DNA
 <213> *Enterococcus faecalis*

<400> 363
 aatcaagccg ctgaaaagaa agaaaaatta gcaattgtga caacgaactc gatcttatcc 60
 gatttagtga aaaatgttgg gcaagacaaa attgagctgc atagtattgt gccaattggg 120
 acagaccctc acgaatatga accgttacca gaagacattg cgaaagcttc tgaagcggac 180
 attttattct ttaacggctt gaacttagaa acaggcggaa atggctggtt taacaaatta 240
 atgaaaacgg ccaaaaaagt tgagaataaa gattactttt ctacaagcaa aaatgttacg 300

ccacaatatt taacaagtgc cggtaagaa caaacagaag atccgcatgc ttggtagac 360
 attgaaaatg gcatcaaata ttagaaaac attcgtgacg tgtagtaga aaaagatcca 420
 aaaaataaag atttctatac agaaaacgcg aaaaattata ccgaaaaact tagcaacta 480
 catgaggaag ccaaagctaa atttg 505

<210> 364
 <211> 557
 <212> DNA
 <213> Enterococcus faecalis

<400> 364
 aaatgggtga aggaagatta gcaaattatt ctgcttcagg aaatacgttt caagaaaatc 60
 cgggatatac gaagaattat aatttctcgg atttacaatt caaccctaaa gcaataactg 120
 gtgatgtgtt acagggaaat acaattgatt ttgaggttta tgggaaacat aatattgcag 180
 cttcaactgc aaactgggaa attcgtcttc aattagatga acgattggcc cagtatgttg 240
 aaaaaattca agttgatccg aagaaggcg taggaaatag tagacgaact tttgtaagaa 300
 ttaatgatc gcttggcaga cctacaaaca tttggaaggt taattacatt cgagcaaatg 360
 atggactatt tgctggggca gaaacaactg atacacaaac tgctcctaac ggtgtgatta 420
 catttgaaaa aaatttagat gaaattttta aagaaattgg tgcagataat cttaaaagcg 480
 accgtttaat gtatcgtatc tatttggtta gtcacgaaga tgacgataaa attgtacctg 540
 gaatagaaag cactggt 557

<210> 365
 <211> 523
 <212> DNA
 <213> Enterococcus faecalis

<400> 365
 aggtacaggc atctttgttg gaagttcatg tctattttct tcactttttg tagccgcaga 60
 agaacaagtt tttcagaaa gtgaagtttc aacagtttta tcgaagttgg aaaaggaggc 120
 aatttctgag gcagctgctg aacaatatac ggtttagat cgaaaagaag acgcgtgggg 180
 gatgaagcat cttaagttag aaaagcaaac ggaaggcgtt actgttgatt cagataatgt 240
 gattattcat ttagataaaa acggtgcagt aacaagtgtt acaggaaatc cagttgatca 300
 agttgtgaaa attcaatcgg ttgatgcaat cgggtgaagaa ggagttaaaa aaattattgc 360
 ttctgataat ccgaaaaata aagatcttgt ctttttagct attgacaaac gtgtaataa 420

tgaaggcaca ttatattata aagtcagagt aacttcttca ccaactggtg acccgtatc 480
attggtttat aaagtgaacg ctacagatgg aacaattatg gaa 523

<210> 366
<211> 400
<212> DNA
<213> *Enterococcus faecalis*

<400> 366
ctggttcaaa agaagccatt gatgcccgcg ttcattttaat taaaaaccaa atcggcgaaa 60
caacgtctga ttttgatcgt gaaaaattac aagaacgttt agctaaatta gctggcgggg 120
ttgctgtcgt taaagtcggt gctgcaactg aaacagaatt aaaagaatta aaattacgaa 180
ttgaagatgc attaaacgca acacgtgccg ctgtagaaga aggcattggtt tctggtggtg 240
gtaccgcact tgtcaatgta attggtaaag tcgctgcgct agaagctgaa ggcgatgtgg 300
caacagggat caagattgtc gttcgtgcat tagaagaacc aatccgtcaa atcgtgaaa 360
atgctggtta tgaaggatca gtgattgttg acaactaaa 400

<210> 367
<211> 264
<212> DNA
<213> *Enterococcus faecalis*

<400> 367
gatcgctcg taattagagt cgcgaaagaa gaagaaaaaa ctgttgaggg aattgttctt 60
gcatccgttg cacaagaaaa accacaaaca ggtgaagtta tcgcagtagg tgaaggctgt 120
gtgcttgaaa atggcacaaa agttccgatg gaagtaaaaa ttggtgacac agtaatgttt 180
gaaaaatatt caggaacaga agtgaataac gaaggcgtag aatacttaat tgtatcagcc 240
aaagacatta ttgccactgt tgaa 264

<210> 368
<211> 505
<212> DNA
<213> *Enterococcus faecalis*

<400> 368
atctcgcgga acaattagat agtattcttt tacaagtcag tgaagaagat gaactaatta 60
tttcagatga tggttctact gatcatacgt tggaaatttt gagaacgtat gcagcgaatt 120
atccccaat tcaattgtta caaggtccag ggcaaggagt gattgctaatt ttgcatattg 180
cgcttacgca tacgaaaggc gaagtgatat ttttagcaga tcaagatgac gtttggttgc 240

caaataaagt aacaacagtg acagaatatt ttgaaacgca ccctgacatc caagtggta 300
ttagtgactt gaaaattgtt gatgcggtt tacaagttac caatccctct tattttaagt 360
ttcgaaaagt caaaccaggg ttttggcgaa atgcgataaa aagtggctat attggggcag 420
gtatggcctt tcgtcaagag atgaaaaacg tcattttacc cattccgcca gaagttccta 480
tgcattgatg gtggattggc ttatt 505

<210> 369
<211> 688
<212> DNA
<213> Enterococcus faecalis

<400> 369
tcggctctaa tggatgttc cattacatta acaagcgtag cgttgccatc cgcagcattt 60
gcagatgaat acgatacaaa gattcaacaa caagatcaaa aaattaatgc gttaactagc 120
caaatgtcag atgcagaagc aaaagttgcc gcgattgaaa atgatatggt tgaaacggcc 180
aaacaaatcg atacattaac agctaaaaag aacaagctat catcagaagt atctaaatta 240
tatagtgaat tttctgattt gaatgtccgt attcaaaaac gtgaagtaca aatgacaaaa 300
caagcacgcg atgtccaagt gaatggtaa agtgattcaa ttattgatgc tgtcttagat 360
gcgattcag tagcagatgc aattggcgc gttcaagcgg tctcaacaat gatgagcgcc 420
aataatgaat tactagaaca acaaaaagaa gacaaagcga ctgttgaaa gaaaacaaag 480
aatgttgaaa aacaaattgc tgaattagaa gcagcaacaa agaattaaa tgataaaaca 540
gaatcattaa aaacattgaa gattcaacaa gaagtggcta aaaatgattt agaagcacia 600
cgttctgaag aacaaggga aaaagacggc ttcattaaac agaaaaaga agcggaaaaa 660
cgtttagcag aagaacaagc acgtcaac 688

<210> 370
<211> 500
<212> DNA
<213> Enterococcus faecalis

<400> 370
gcttcattag cattagaaca atcatcagct gaaagttcta aagctggctt agaaaaacaa 60
aaagcagctg ctgaagcaga gcaagcacgc ttagctgctg acaaaaaagc tgcagctgaa 120
aaagccaaac aagctgctgc aaaaccagct aaagctgaag tgaaagcaga agcaccagtt 180
gcctcttcat caacaacaga agcacaagca ccagcaagct caagctcagc aactgaatca 240

agcacgcaac aaacaactga aacaactaca ccaagtacag ataatagtgc aacagaaaat	300
actggctctt cttcatcaga acaaccagta caacctacaa caccaagcga taatggaaat	360
aatggtggcc aaactggtgg tggaacagtt acaccaaac cagaaccaac accagcgct	420
tctgctgac caacaatcaa tgcattgaac gttctacgac aatcattagg ttacgtcca	480
gtagtatggg atgcaggttt	500

<210> 371
 <211> 529
 <212> DNA
 <213> Enterococcus faecalis

<400> 371	
ttaactgaac aagaaaagca agcaatggaa aaagaagcat tagcattaaa taaagttttt	60
cctgaaaatc aagcagatgc ggcaaaagta acggaaatga tcaatgtcaa aaatcctacc	120
gaaaaacaaa agcaacaaat gagcgattac gttgtaggac ttatcaatga tggtcgcgaa	180
aagcttggtg taaaaagtt gaagatttct aaccaagcta tgaaatttgc ttgggatgta	240
gcaaaatag ataatccaa agaatttgat catgacgtaa atgcgatcaa tcgtgcagca	300
aaagaaaatg gttttaaaga attccctgga caaaactttt atgaaaacct aagtatggga	360
agatttacga cacaagaagg taaagtttct atgtatgact ttgaaaagc tgctcgaaat	420
gcacttgtaa gcatgtgat gaacgatgga cattctggct attccattt agattcttta	480
ttagatgcaa atgaaacaaa catggcagtt tctatttcag gagatttaa	529

<210> 372
 <211> 558
 <212> DNA
 <213> Enterococcus faecalis

<400> 372	
acaaccaaca gtgaaagcta cacaacaac ggagcaagcc attactgaaa aacagcaaca	60
agtaatagag aaacaagcaa ttgtcgatca aaaacaaca gttgctgaca ctgcgaaaaa	120
agaaaaagac accattgatc aatctgttaa agaccaaca gcagtggctg atcaaaaca	180
agacgcattg gttcaaagtc aacaagcagt gactgacca caagcagttg tagacgaagc	240
taaaaaagtc gtggatgaag caacacctc agccattgaa aaagccaaag agcaagtggc	300
tactgataca caggctgttg atgaccaaca aaaagtagta gagcaagctc aaacagacgt	360
taaccaaca caagctgttg ttgatgaaa agcaaaagaa acgactgctg ctaaagtgca	420

aatgataaa gatcaacaag cagtaacagc tgcaaaacaa gaacaagtca agcttgaaga 480
 attagcgaaa aatgcggaag cggaataaagt aaaggcagaa aaagaacaag cagcaaaaaga 540
 agcagaattg gctaacaa 558

<210> 373
 <211> 687
 <212> DNA
 <213> Enterococcus faecalis

<400> 373
 cattggtggc tatttcattc gtgaattgga agccactaca atttccgatt ttaaaaaaaaa 60
 tatggattcc caagttgtcc aattgtcaaa cacgttaagt acgcagatga gcaacaaaga 120
 tctcgaaagt agtgacgttg atgcaaatat aaaaaaagcg ttatctgatt tttcaaatgc 180
 agatattttct gaagcgagaa ttgtcgatga taaagggatt attcgggcaa ccaatgattt 240
 aatcaacaa aatattattg ggaaaaagaa tgattatcgt gatttaaatg actttacgag 300
 taaaaaatat caagcttttag ataatgataa acgcgtgtat gtgaatgtcc agccgattca 360
 atcgctact ggagaaacag tgattggcgt cttttatgtg aaaagtaatt tagaaaataa 420
 ataccaagaa attaccaaca cagcaagtat ctttttact gcttctatta ttgccgcagc 480
 aatctcgatt attgtgactt tactgattgc acgatcaatc acgaagccga ttggtgaaat 540
 gcgcgagcaa gccattcgaa tcgctcgtgg tgattacgct ggaaaagtag aagtccatgg 600
 aaaagatgaa ttaggccaat tagcagaaac atttaataca ttatcagaac ggattgaaga 660
 agcacaagaa acaatggaag cagaaag 687

<210> 374
 <211> 534
 <212> DNA
 <213> Enterococcus faecalis

<400> 374
 tatcttagct tcgcaaccag ttactcgttt taggaatgct tttttcaatg aaacggaaga 60
 tatccaaacc aatgaagaca gtcaagactt aacctacag agtaaagaag aacgattgtt 120
 tgcagaagaa aaactgggaa aaattgattt taaagggacc ttgccagaag agaataaacg 180
 ggactcaatc tataatcaaa gcttttctta tgtaaaacgt ttaggaacca atatggggaa 240
 tttgcgttac tttgatcgaa cgaaagatag tgtcaattat cggacttttg tggaaggttt 300
 cccagtgttc agtaatgatt taaaaggcca agtggatatt cgcacacga acaacgatgg 360

tgctgcacca agcgtaacca ttaacacaag tgtgaatacg atccaagtgc cgattccttc 420
 agaagaagaa gtgacgctgg aaagcacgga aaaattgatt aagcgtttag aaacggctgg 480
 tgctaaaaag gaaaaaattc aatcggtgtg tatcggttat acgtggcaga caat 534

<210> 375
 <211> 547
 <212> DNA
 <213> Enterococcus faecalis

<400> 375
 gagcaacgtc tcttcttcca gccaaacaga atcgattgaa agtcggttgg aaaaagataa 60
 catctcgtat aaagggacac tttcttcaga acgattggaa gggtattatt taagtggcga 120
 acaaaccaat ttttctgctg ctttaaaaat ccaacgtgaa aagaataaaa attttttgag 180
 aaatgggctg caaattgcgg ataatacttt aacgagtgtg cctagtataa actattttat 240
 tgatcctaag aaaattgata aagatttaag taccttttta aatgaaaaaa atgctttatt 300
 attcggagac gaatatcaat acttaccaga attttctcat ttaaaagagc cgacggcaga 360
 aattgtggct gcacaatcgt ataaaggaat tccttttaga gacgacacgg caaaattaag 420
 tatttttagca gattcgtcag gtgaattatg gcaaattagt aaatattcgc aaacgcacat 480
 tgaaaaatatt gaagagttac gagacaaaac ggatttatat tccaatcgtg atgcgataga 540
 cacgctc 547

<210> 376
 <211> 224
 <212> DNA
 <213> Enterococcus faecalis

<400> 376
 ttcacgcaa taatcgttcc tttgttggtc taacggatac aggttattgt agcgatcata 60
 ttcgtggtac gattgaaaat gcagatgctt atttagtoga aagcaatcat gaaattgaaa 120
 ttttgcgagc aggaccttat ccatggagtc ttaacaacg gatttttagga gataaaggcc 180
 atttatccaa tgatgatggg gctcttgtga tggcggtatg gtta 224

<210> 377
 <211> 500
 <212> DNA
 <213> Enterococcus faecium

<400> 377

tcttcatttg ttgaatatgc tgttttaagt attcgatgcg atattcatca tgtatgtttt 60
tatcatctgt caaaacatct atggcaccta atccattttc tgtaattatg ataggagtc 120
catattttct ataagtgtaa ttcagcagat accgtaaacc cgtcggatca atgggtccatc 180
cccatttact agtcacaaga tacgggtttt gaagaccgcc aaataaggca ctcttttctt 240
cagctgctcc ttcgtacttc gcaacagatg atgcataata gttcatacca ataaaatcaa 300
gtgttccttt agagaacata tatttatcat tctctgttat ggtcaacttt attccttggt 360
ctgcatattc attgatttta tagtctggaa actttcctgt gcacatagca tctatttgat 420
agaaatctcg atccatttgt ttaaaagcat tcatcacatt tgttgattg caatctactg 480
gataaacagg ttcgattcca 500

<210> 378
<211> 665
<212> DNA
<213> Enterococcus faecium

<400> 378
attattgtcg cctctttccg ctacgcgatt aacatgaatc atcaaataag tgtattcatc 60
ttgagataaa taggtgttga actttccttt tacatatatt tctatctttt ctacagctgt 120
atatgcttta gggatatagt tttttacttg ttcaaataac tgagattcat tttcaacgta 180
tgcttgtttt tttcttaatc gttcaataaa atactgtaaa tgtgtcacta gcctcatgta 240
gttgatgctc tcttcgtcaa tagataaact aaaatgatat ttgatgatat tcaacatgct 300
tcttagtgct tccatatctt ctatctgttc atcaaaattg acctgatttt cttgaagatt 360
aacaaagtgt aaggcaattg aaacagcttc atctgtggga aaggaaatgat taaaatattt 420
cttcatcatt tttaaagctt ccaaaccgat tttgtaataa actggataaa actttttaac 480
ttccaaaag agcggacttc taagatatgt tcctttttct gagcgtttca atgcaaagga 540
gagatgatct aataaagcta aataaagata atcatttgct tttttaccga tttccttttc 600
tccataacta acgagctcgt tgatcataga gatcagtcta tcatcagaat gcgataacaa 660
atagc 665

<210> 379
<211> 504
<212> DNA
<213> Enterococcus faecium

<400> 379

ctcctgatcc tcttcttggtg cagggacgcc taagagataa gcagctacag ctgatccagc 60
 aaaactaatc acgactgccg ctaacataaa ccagaagttc atgaaatctc cttcacctat 120
 atacgctggg aggccaaata aacccaagc aacagaataa gctttaacac tagtcaaacc 180
 agcaaataat ccaccaagtc ctcctccaat cttactgca acaaattggtc gacgatattt 240
 aacaaagaca ccatagatag caggttcagt cacaccaagt actgcagaaa gtgttactgt 300
 cccaaataat tgtttttggtt ttaaattccg tgttcttaag aaatacccaa gcattgctcc 360
 cccaacagca atatctgaga ttgtacatga agatataaat gcagggtcat acccatttgc 420
 tgcaattaga gaagctacaa ccggcatgat aaagtctcct gcgccaaca ttataataaa 480
 tgggtgaaga gcagagtata acat 504

<210> 380
 <211> 555
 <212> DNA
 <213> Enterococcus faecium

<400> 380
 cggatgaagg aagtaaagaa aagttgtcag tcgtggctac caattcgatc ttggcggaca 60
 tggcaaaaga agtaggtaca atagatatcc acagtatccc gttcggaaaca gatccgcatg 120
 aatatgaacc attaccagaa gacatcaaaa aggcaagtgg tgcagatggt atttatataca 180
 acggtttgaa tcttgaaaca ggtaacagct gggtcgataa cttgatggaa acggctaaaa 240
 aagaaggga agattatatt gcagttagca aaaatgtaga acctctatat ttaactagcg 300
 gtgaagaaca tacaaaagca gatccccacg catggctaga cctatctaac ggaataaaat 360
 atgtggagga aatcgcacgt atattctctg aaaaagatgc agaaaatgcg aactctata 420
 aaaaaaatgc agaagcatat gtggaaaaac taaaagaatt agatacccca gccaaaggga 480
 cttttgcttc tatcgaagag aacaaaaaat tattagtaac aagtgaaact gctttcaagt 540
 atttacgagc atatg 555

<210> 381
 <211> 401
 <212> DNA
 <213> Enterococcus faecium

<400> 381
 aaagcgattt gttgctgaca gcactcggtta gtggaatcgt cttgatattt gtctttttct 60
 ttataaaga attgaagatc acatcttttg atccgacaat ggcaaaggct ttttggtga 120

acacttggtt gatccattat cttttgatgt tctttttgac attagtggct gtagtcagtt 180
 tacagacagt aggaacaatc ttggtgattg ccatgttgat cacaccagcc gccacggctt 240
 acttgctaac gaaccattta ctgaaaatga tcattacagc tgcaggaatc ggtatgctaa 300
 gtgcagttgt cgggtgtgtt ttccagtatag ttacattggc catcagagct acgatcgtgt 360
 tagcatgtac cgcatttttt atccttgcta atttaatttt c 401

<210> 382
 <211> 507
 <212> DNA
 <213> Enterococcus faecium

<400> 382
 agccggtaaa ctacgtccgt aaaaaaatag cctacgtgga acaacgaagt gaattggatc 60
 tttcctttcc agtcatggta ataggcgttg tacttttagg aacatatcca tctttacgaa 120
 ttggacaaag acctgggaaa cctggaaaag aacgtgcaag acaagctttg aaaaaagtag 180
 ggttgaaga atatgcaaaa agacagatca gcgaactatc ggggtggacag ctccagagag 240
 tttttattgc aagagctcta gcccaaggag cagaatggat ctttttagat gaaccattcg 300
 tagggattga tgcgttaagt gaacgaaaga tctttgacat cttgcaggaa ttgaagaatt 360
 caggaaaaac gatattgatc gtccatcatt ttcttcataa agtagacgaa tatttcgatg 420
 aggttattct tgtaataaaa cagctgatcg cttccgggtcc agtacaagag tcttttacat 480
 cagaagacct tcaattgcct tatggtg 507

<210> 383
 <211> 456
 <212> DNA
 <213> Enterococcus faecium

<400> 383
 attactcggt tcccctgaca gttggcagga catgctgatc gtagacaagg tttctaaaga 60
 cggtatcgaa gcaaatatgg cagtcatgtc gcaaaaagga ttgattggcc gagtgatcga 120
 ggtcaatacg gcttcgtcta aaatcgaatt actgtcatcc tctaataaaa gctccaatca 180
 ttttcagta cgggtatctt cggctaattg cgaagcgttt gggttgctta aaaactatga 240
 tgaaaagctc catgccttag tggtagacca attaactggt gatacggata tcaaagaagg 300
 ggatgttgtc cagacatccg gtcttgaggg gaattctcca gctaacttgc cgatcgggtac 360
 ggattataaa acgaaaccag atagtattgg gctggatcgg gaagtttatg tgaaacctta 420

tgcagaaatg tatgacgtgt cagttgtgac gattgt 456

<210> 384
 <211> 500
 <212> DNA
 <213> Enterococcus faecium

<400> 384
 atgttgaaga aagaaacaat gaagtactat ctgccaatcg ttttgttctt tttgatgttg 60
 atagatggtc atttaacaag aatgctaggg gagtggtcga aaggcaccta tatgtcaaat 120
 gccacttttc tgatattggc attattatgt tgcagtatgg cgtttgaaaa acgttattta 180
 ctgattacca cgattgttct cggggctatc tatgacgctt actatattgg cgttatcggt 240
 atctatgcag tagctctccc ttaattgta tggttgatgt atgtaatgaa agacgttatac 300
 catgtcaaca tctttactga atttttcagt atgatcatct ttgtcacggg ttatgaattg 360
 tttacgatgg tgggccagtt gatttttaaa ttagcagtag taaataacac gtattttatt 420
 acaaggtttt taggacctac actgctgttg aacatgatta tatttgtatt attcattttt 480
 ccctttaaga aattattcag 500

<210> 385
 <211> 507
 <212> DNA
 <213> Enterococcus faecium

<400> 385
 tcagtcagtt tcttgacctt tttcgtaaag aagccggcct ctactaaaa gcttcagtaa 60
 tcagtcagaa tttcgttcct accgcagctg gattagcctc ctctgccagc gggctagctg 120
 ctttagcagg agcttgcaat actgctctta agcttggatt agacgatctc tctctttcaa 180
 gatttgctcg acgcgggtct gggtcagctt gccgaagtat tttcggtggt ttcgtcgaat 240
 gggaaaaagg ccatgacgac ttaagttctt acgctaagcc agtcccttcc gattctttcg 300
 aagacgattt agcaatggtt ttcgttttga tcaacgacca gaaaaaagaa gtgtccagca 360
 gaaatgggat gcgtcggaca gtcgaaacat ccaattttta tcaaggctgg ttagattccg 420
 ttgaagggga tctatatcaa ttgaaacaag caatcaaaac aaaagatttc caacttctcg 480
 gagaaacgat ggaaagaaac ggactaa 507

<210> 386
 <211> 508
 <212> DNA

<213> Enterococcus faecium

<400> 386

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ccaattaggt gaagcagaac ttgtgatagc cggcggaaaca gagagtatgt ctcaagcacc      60
tatgctgaaa ccgtatcagt cagaaacaaa tgaatatggg gaaccaatth ccagtatggg      120
caacgacgga ttgactgacg cattttcaaa tgcacatatg ggattaaccg cagagaaggt      180
tgcaacacaa ttttctgtga gcagagaaga acaggatcgc tatgccttgt cgtcccagtt      240
gaaagcagca catgctgtcg aagccggtgt attttctgag gagatcatcc cagtcaagat      300
ttctgatgaa gacgtgttat ctgaggatga agcagttcgt ggaaatagta cattggaaaa      360
actgggcacg ttacgtacag tatttctcaga agaaggaact gtaacagcag gaaatgcttc      420
cccgttgaat gacggtgcct ctgtggtgat ccttgcaccc aaagaatacg cagaaaataa      480
taatctgcct tatttagcaa ccatcaaa      508
```

<210> 387

<211> 501

<212> DNA

<213> Enterococcus faecium

<400> 387

```
gattgccttt cttttctatg caacaaaagt caccgcattc cttgaagagc tggatgcaat      60
ggacgatcaa ctggtttctt cctactattc aggaaattta gccgaagctc ctcatgcatt      120
aaaaaatatc aaaaaattat tcattcactt aaaaaaacag catgacatcc aaaaaaactt      180
gcaactgacc attgaaagca cgattcctgc tgaacgtgga atgggatcaa gcgctgcagt      240
cgccacagca gtcactcgtg ctttttatga ttacttagca tttcctttgt ctctgtgaaat      300
actattagaa aatgtccagc tttcgaaaaa aatcgccac ggtaatccta gtggaatcga      360
tgacgccgct actagcagct tgcagccgat ttattttaca aaagggcatc ctttcgacta      420
ctttcttttg aacatcgatg cttttttgat tgtcgtgat acaggaatca aaggacaaac      480
aagagaagcc gtcaaagatg t      501
```

<210> 388

<211> 505

<212> DNA

<213> Enterococcus faecium

<400> 388

```
caagaacaag aaactcagca ttctatcagt gaggttacttg ccctggattg gccagggtcta      60
tccattgagc cattgattgc tcctgaagat ttacgtttat tgattggttg gacgggtagc      120
```

cctgcctcta cttctgattt ggtcgatcaa gttcacggtt cgagagaaga taaaatggtg 180
gcttatcagc ttttcttaaa aaacagtaca gaatgtgtca atgaaatgat caaagggttt 240
aaagaaaata atgtaacggtt gattcaacag atgattcgaa aaaaccgaca attactgcat 300
gatttatctg caatcactgg ggtcgtcatc gaaacgcctg ctttgaacaa attgtgtaat 360
ttagctgaac agtatgaagg agccgcaaaa tcttctggtg caggtggggg cgattgcgga 420
atcgtaattg ttgaccagaa atctggcatt cttcctttta tgagtgcatt ggaaaaagca 480
gaaatcactc cactgccgtt acatg 505

<210> 389
<211> 585
<212> DNA
<213> Enterococcus faecium

<400> 389
aaattcactt actgcaccag agccgtagct gaatagaccg atgcgatctc ctggctgtag 60
tgatttcgaa ttttccagta gagaagtttag cccaggtat aatgaaccag tgtaaagatt 120
accgattcgt cggctgtaac ggatgctttc ttcatagcga gccataagac gttcctgatt 180
atcttcgtct gtttggctta atacgctttg caatgccttt tttcccatct tagtatacgg 240
aatatggaaa gcaatgcctt gataatcttc gagtctctga cccgacaatt ctttatgtcg 300
attccaaact ttttggatg attcgatata cgtagaatta gataaaggac catcaacaac 360
aggaaattcg ctataatctg gacgccagaa atcatagata tcttctgtca gaaatacgtc 420
gtcgtcttca atcgataaaa tacgcgggtt ttgagtgtc atcatcgcaa cagcaccgac 480
accttgcgtc acttcaccac cgcttgccaa gccgtaacga gcaatatcac ttgctatgac 540
tagtactttt cgttctggat gatttttgac atattctttc gccat 585

<210> 390
<211> 300
<212> DNA
<213> Enterococcus faecium

<400> 390
gcatatttcg cttgatatat aggttcatac gtggtggaac aacgtatgat gttttaggaa 60
atagttgtga taaatcacgt ggtctactca catttgtaat atcataccgc ttttttgctt 120
caggagaaga agctctaata tcaatcctaa accagtattg tcagcgcgac tcataacaac 180
aagttctgtt gttaatggat caaaatttct ttctatacac tcgatactcg cataaaaagg 240

cttcatgtcg attagaaaat aatcattttac tgattctttc gaataatcca gcatgaataa 300

<210> 391
 <211> 273
 <212> DNA
 <213> Enterococcus faecium

<400> 391
 atatttcac ccagctctt tttttactaa tataccaact acatttaata acaaaaataac 60
 tagtaaaact aatattttta gtggcataga atattcaaaa ataaataaag gcaccataca 120
 tgtagctatc aatataaata cagaacttac gtattttatt attttacgga acattataac 180
 ctattacaac tccgcaaata gccatagccc ataccataga taagattttt accagcacca 240
 ccaccacatg tttgttttat ctctttcata ctt 273

<210> 392
 <211> 626
 <212> DNA
 <213> Enterococcus faecium

<400> 392
 agcagttccg gtatctcttt ttttctcaga atattatttc tatgtgcttt gttacaatcc 60
 attttctttc aaaaaatagc atcatttata atatggttct ccgtatcgcg agcgaatggt 120
 attggctaatt ctcttgcaa acaagtgttc accacaaaat tcctaactaa acaaaaaata 180
 gcataaatta atgctcttag tcacagatca tactgtaaca gtatgatctt attttctgac 240
 aaaataagaa taccaatcat ttatggtacg acattctaag cgtaaatagat tgatattctt 300
 ttgcagaaac attcttaatt tgtacctaaa gattgctgac taaaaaatag atagaaaatt 360
 ttcttcactc tatttaatac gttgcttgaa gttttatagt tatctattaa cattctcgtc 420
 ccctattgtc ggggataggt ttcgattaga tgaactcgaa aacgttgcta tatcaattat 480
 ggaaacatta ttctctgtcc agtgatggga caatccatac tcttccaatt agttatttgg 540
 tcgattcacg ggaaaaattt tatatgcagt tcattattac tactcatctt cagactgtac 600
 cgattcaaaa cattaccctt ttttca 626

<210> 393
 <211> 508
 <212> DNA
 <213> Enterococcus faecium

<400> 393

tgaagtcctt tgtctttggt gcttagtacg ctcgggattt cttctttttg tcaaggatga 60
 aaatgatttt tcaaaggatt ttggattttc attgtatcta ttatccaaaa tgttttgaat 120
 gtttaacact aatgtcataa ctaataatgg cttattgcta gcgtctatcg aagtattttt 180
 tatttccttc aatatcaatg tcatagagat agacatttaa aatctgcgac attttcaccg 240
 ggatttagcc catctttttc gtcaattttt ggattctttt ttagtttcta ttggaaagaa 300
 tcttcaactg acataattca ttttgtattt ttatctgtcc tcttaacatt ttagtgtcaa 360
 ttttaatagt gcttcacacg agaaaggat aaacatacca ataaatttgg tatgactaat 420
 gaaccttgca ctgcatagta tagccatacg cggatatact atatctctta tgttccttag 480
 agtaaaacct ctaaacgggt gtgtattg 508

<210> 394
 <211> 321
 <212> DNA
 <213> Enterococcus faecium

<400> 394
 tctattaaac agacacaact tatctatggg ggtaccactc atagtggaaa atattatgga 60
 aatggagtgt attgcactaa aaataaatgt acggtcgatt gggccaaggc aactacttgt 120
 attgcaggaa tgtctatagg tggtttttta ggtggagcaa ttccaggga gtgctaaaat 180
 gaaaaaaaaat gctaagcaaa ttgttcatga attatataat gatatatcta taagtaaaga 240
 tcttaaatat tctgatattc ttgaggtttt acaaaaggta tatttaaat tagaaaaaca 300
 aaaatatgaa ttagatcccg g 321

<210> 395
 <211> 613
 <212> DNA
 <213> Enterococcus faecium

<400> 395
 ttcataagga cgatgtgttg gttagattgg attgttcttt aatagagaat gaaaaggctc 60
 agatagaaca agaaaaccaa cgtattactc aacaaataaa gatggctcag ctatttattg 120
 aaagtataag taaaggaaaa aatttgtttt caacggatga cagttttggc tacagtaatc 180
 aattaaagag catgttgtca gaaaaagaat cactccgcta cgctttgaag caaagtgaat 240
 taaatgatca aaagcaatta gaagtatacg aaaagacaaa aagacaacta gaaaaacaaa 300
 ttgagagttc agatagtaaa ttacaagaat ggcaacaagt acaggtagct tggagtaata 360

atcaatcatt aaaagatttt tcaaaagaaa tgatggcaaa ctatgagaat tggcaagaac 420
aactaaataa tgtttctgat gatcaaaaa atcaagtga actgacaatt tcagcaagca 480
taaatagaaca aattgagcaa ctaaaaaaag aagtagaaca gtatcagtca gaaaaagcta 540
aattagttaa accaactact tctgagaatg acagaattag tcaaacggaa aaaggaaagc 600
aagagctaga aca 613

<210> 396
<211> 400
<212> DNA
<213> Enterococcus faecium

<400> 396
attatgtgaa gatcaaatta tacaattaa tcagttagaa cgaattattg ataatttcat 60
tctttttcac gataaagtat ttaagatagt attgaaaaca caaagtccgt tagaagttaa 120
aaaatacctc aaacaattcc gaccaaagca aggaatatat ttcttagata ttgatttaaa 180
tcatgaagtt aacggtatag aattagcaga agtaatcaga aaatatgatg ttcaagcaaa 240
aatcatTTTT acaactactc atgatgagat gttaccgta acaataaaaa gaagagttga 300
aacggttagga tttgtaacaa aagatcaaac actagatgag tatcgaaacg agattgttga 360
gttattgtta ttagcgcaag aaaggataga tgcaacaaaa 400

<210> 397
<211> 533
<212> DNA
<213> Enterococcus faecium

<400> 397
atcttgatct tgccattcca tttttcttt accgaaaaga ttagcttttc tagtcaagta 60
attaacaagg gggtgttgt ttttctggat tgtatccac atgacagaca atgtttcttt 120
cttcaaccga ttgtactcta atggtttttg tagaaaatct gtgacacat gaagttcata 180
gtcagaaagt ctaaaacat ctaaatgatt caaagtatcc gtgaagagg gtgccttttc 240
ttccaggct tcttcccatg ctgcgaaaag tgtttctctg acttttgat ctggatcgcc 300
catcatctta ttgaaggctt gtccagcaga taattcgact actgttccat cttgttcgaa 360
gggaatcgaa atgctggcta caatcgtatc ataatgactg ctccaagcat ttagaccatc 420
taaagaaagc gtatttataa tgttttcttc agcttctgat aataattgtg agccatcacg 480
acgaatctcg tttaaacgaa aagcaattgt ttcaaacgaa gattgagaaa gca 533

<210> 398
<211> 171
<212> DNA
<213> *Enterococcus faecium*

<400> 398
tgaatcttca gcaacagaag aatcaacaac agtgcctgaa tcttcaaca cagaagaatc 60
aacaacacct gcgcctacaa caccatcaac agatcaaagt gttgatacag gaaacggcac 120
aggaagtagt actccggctc caacgccaac accaacacct gaacaaccaa a 171

<210> 399
<211> 519
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 399
aggatcattt gtctcctacg gcccgactg ggccaacgtc agcaacgccc cctacgcca 60
ttatcacaaa accaccagcg cccagggcgg catcaatacc gactttatga tctccggtcc 120
cgggatcacc cgccacggta aaatcgacgc ctcgacgatg gcggtgtatg acgtggcgcc 180
gacgctatat gaattcgccg gcatcgatcc gaacaagtcg ctggcgaaaa agccggtggt 240
gccgatgatc ggcgtcagct ttaagcgcta tctcaccggc gaagtacagg agccgccgcg 300
cggcaactac ggggttgaac tgcacatca ggcggcctgg gtcgatggcg aatggaagct 360
gcgacggctg gtgcccgcgc gcctcaccgc cggcgacgcg ccgtggcagc tgtttaatct 420
gcacgacgac ccgctggaga cgcgatgatg cgcggccgaa catcccgatc gggtaaagc 480
catgagcgag gcctacgagg catttgctaa gcgcacat 519

<210> 400
<211> 320
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 400
ctgatcaacg acgcatggtg ccgactgttc cggaacatg gctttattat cgggttgagc 60
ctcgaaggca acgaagcgt gcaggactac catcgtccgg ataaacgcgg ccggtcgacc 120
tggtcggcag cgctgcgcgg cattgacctg ctccatcagc atcaagtggg ctttaatctg 180
ctggtggtgg tgcataacga gatggcgccc cagcggcggc cgatttatga ccggctggtc 240
agcctcggcg cgcgctatct gcagtttcag ccgctgatga gcgaaggcgc ggccctgcgc 300
gaaggatacc agctcagcgc 320

<210> 401
 <211> 201
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 401
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 gtgatctggg gcatccaggc ggcggtcgag gcctttaaga aagagggtca cggcgggaaa 120
 atcatcaacg cctgttccca ggccggccac gtcggttaacc cggagctggc ggtgtatagc 180
 tcgagtaaatt tcgccgtacg c 201

<210> 402
 <211> 305
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 402
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 gggaatctac ttgataacgc ctacaatgcc agcctgcgtc aaccgcaggg ttcaaaacag 120
 atcgaatgcc tgatcaacag tgatggccag gaggtgatca ttgagatcgc cgaccaggga 180
 tgcggcattg acgaggcgct gcgcgatcgg atcttcgagc gcggcgtcac cagcagcgcc 240
 agcaaagatc atggtatcgg actctggcta gtacgcagct acgtggaaca agcaggcggc 300
 agtat 305

<210> 403
 <211> 608
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 403
 gccaccttta ttccttcgcg gctggtccac tatggtctgc tgectgacgt ggttattgaa 60
 tccacgacca aattctataa atccaactaac atcctctatc tctatatctg ctgcatcatt 120
 gtcggcagca tcatgagtat gaaccgcacc acgctgattc agggctttct gaagatcttc 180
 ttcccgatgc tgtgcggcga agtggtcggc atgctggtgg gcatcggcgt cggcacgctg 240
 ctgggcatgg agccgttcca ggtgttcttc tttatcgtgc tgccgattat ggccggcggc 300
 gtgggagagg gggcgatccc gctgtcaatg ggttatgccg cgctgatgca tatggagcag 360
 ggcgtggccc tgggccgggt attgccgatg gtgatgcttg gcagcctgac ggcgatcgtc 420

atctccggct gcctcaacca gctcggcaag cgcttcccg c atctgaccgg cgaagggcaa 480
 ctgatgccga accgcagcca tgaaaccgc agcctcagcg agagcgaagg cgtgagcggc 540
 aagaccgacg ttgggaccct cgcctccggc gcgctgctgg cggctactgct gtatatgatg 600
 gggatgct 608

<210> 404
 <211> 490
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 404
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 ttggccatt atcagcagcc tgttatttcc ctgaccctgg tgaccccggg ggcgggtgaag 120
 gacagcattc gctatcgtaa tatgatgggc gttgccctcc aggcctgcga tcagctgctg 180
 tggaagcacc gctggcaaac gctggatcgt cagggtgctat ggctgccgac cgggccagaa 240
 gcgctgtggt gcgtagcgca tccggccagc gaaatcaaag cgatgtgcag tacgctggag 300
 cagatccatc cgctgggacg cctgtgggat atcgatgtaa tctgtccgca gaacgggctg 360
 gtgggacgcc agtcgctggg cgaatcgag cgccgctgcc tgctgtgcga tgagccggcg 420
 cagcctgtg cgcgacggc tcgtcacgac accgatctcg tcgtcgcccg cgttgagcag 480
 atgattgacg 490

<210> 405
 <211> 509
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 405
 gttgttctcc actaccact ggataaaggc ctccccatc accggcgctt tgtcatcaat 60
 tccggcttgc gctttgatgc gggccggcag atcggccgcc ggacgcgggg tgatgcggtc 120
 caccatggtg ttcggacagg tggattggc cgccatccag tcaatcacgc cctgtttgcc 180
 ggtgagctgc aggaactcga ccataccgtc gtggaaacgc tcgccgttat ggcgcacgtt 240
 atcgcagttg agcagggtca gcggcccggc gttgtcggcc atgcgctttt ccaggatccg 300
 cgcgagggtg ccgtaaattg ttttgactc gccttgacgg tcggcctgca gatcggggtt 360
 gctggtttcc agccgatggc gagtggtcag gtagtacctt ccttccgtca cggtaaaggc 420
 gataactttg gtctgcgggt ttgccccttc gttaatcagc ggctgtagcc cggcctgcc 480

cggtagcagt ttctggattg aggtgatct 509

<210> 406
 <211> 533
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 406
 gacttccggt ttttcacaca ccgcggcaat gggtttgccc gccgccaggc aggccagccg 60
 cgccgcgccc agcgcgcgcg cggtctctcc gcctttgtgg gtcaccaccg gcatagcgag 120
 aatatcggcc agcagctggg ccagaaacgg gctgcgggcg ccccgccca ccagcgagca 180
 ctgcgcgata ggcgtcccgc tctctttcaa tgctgcagg ccgtcgttga tcccaaagct 240
 caccctctcc agcaccgcgt agccgagctg cgcgcgcagg ctggcgtggg tcatgcccc 300
 gaagatgccg cgcgcgtcag gatcggtatg cggggttcgt tccccggaga gatagggcag 360
 gaagaacggc gcgttggttt tatcctctc gcttagctcg gcaatctccg ccagcagcgc 420
 cacctccgtg gtgccggtca agcggcagaa ccaactgcaa cagctggcgg cgctcagcat 480
 gacgtcatc tggtgccaca ggttcggcag cacgtgacaa aacgcatgta ccg 533

<210> 407
 <211> 260
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 407
 ccagctcgga aaacttctca cgggtggtga gattctgcat atgctgcggc gtttgaatat 60
 ggcgcaggga aaccagggca atcacgcccc cggtaaggca gaaggccagc gccagccaca 120
 gggtgcccat ttgcgcaatg tgaggaatgg taaagctcgg aatatagctg ccgaagaccc 180
 cgatgccgat ggaatacacc gcccagaacc agccgatggc cgagctggcg ttgtcgcttt 240
 tgacgttatg gacaatcgcc 260

<210> 408
 <211> 501
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 408
 taacggcaaa gacgctaaaa accggcaacg tcggtgtctc ttttacgggc gatggtggtt 60
 ctaatcaggg cctgggtcttt gaagccatca atatggccgt cgtgctccag cttccagccg 120
 tctttatctt cgagaataac ggttacggcg aaggaaccgg ccatgactac gccgtgggtg 180

ggcgtgatat cgcccggcgc gccgctggct tcggcctgcc ggcagtgacc gtcgatggca 240
 ccgatttctt tgccgtttat gaggcaacct cagaggcggc caagcgtgcg cgagaaggcg 300
 gtggcccaag cgtcattgag gccaaagcct tccgctggca tggtcatttt gagggcgatc 360
 ccgcgctata tcgtgcggaa ggtgaagtgc aacgcctgcg tgaacaacat gatccgctga 420
 agattttcac cgctaaggtc aagcaacata tcaccagga agaactggcg gcgattgacg 480
 aggaagtaga agccctggtc a 501

<210> 409
 <211> 535
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 409
 cctataatat ctttgccacc acgcctggac tgaaggtggt ggtgccctcg acgccttatg 60
 acgtcaaggg tctgttaatc cagtccattc gcgacgacga cccggtggta ttctgcgagc 120
 ataaaatgct gtacgacctc aagggcgagg taccggacga gatctatacc atcccgctag 180
 gtgtagccaa ctacactcgc gaaggggagg acgtcaccat cattgcgttg tcggcaatgg 240
 tacataaagc aaaccagggtg gcggacaaac tggccagaga ggggatctcg gtcgaggtgg 300
 tcgacccgcg aaccatttcg ccgctggatg aggaaggtat tctggaatcg gtggcgtcca 360
 cggggcgggc cgtgattgtc gacgaatccg ctgcacgctt cggttttgct catgatgtcg 420
 cggcgctgat tgcgtcccag gcattccatt tctcaaagc gcccgttctg ctggtgacgc 480
 cgccacacac gccggtcccg ttctcccctg ctctcgaaaa actctggatc cctgg 535

<210> 410
 <211> 543
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 410
 gcttgaaatg ccaaagtggg ggctttccat ggaggaaggc ttgctcgtc gatgggcaat 60
 ccaggagggt gacgatttca ccagagggca ggaaatatgt gagattgaaa ccagtaaaat 120
 cgtcaatgtg ctggaggccc cttttgccg tacgttacgt cggatactcg cccgcgaggg 180
 tgagacgctt caggtaggcg ccgtgctggc cctggcggct gacgcgtcgg tcagcgatgc 240
 tgaactggac gaatttggtt cccgcctggc gacggcgaaa cccgcagccc caggcccggg 300
 ggctgccgcg ccggacgtag cggcacaggc aggcgctaag ccagcttcg ttgtttcgcc 360

gccatccaac agccccgagc cccctgttgg gcagaccgtc atccccgtca gtctgcaagg 420
tgtgaccgat gtgactcagg ttaatgccac gcccacatgcg ttacgactgt ctgcccgtg 480
gggtgtcgac ctgaaaaaag tcgcggcagc gggcgcgggg atcgtatctc tgtttctgat 540
ctg 543

<210> 411
<211> 596
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 411
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cattatgaga tccctgtccc ctggtttctg ctgaccatc cgatgggtt tacgctgatt 120
gacggcggtc tggctgtcga aggattgaaa gatcccagcg gttattgggg aagtactgta 180
gagcagttta aaccggtgat gtcagaagaa cagggttgcg tggaacaact taagaggatt 240
ggcattgctc ctgaggatat ccgctatgtg gtcctgtccc atttgactc tgatcatacg 300
ggagcaattg gtcgcttccc ccatgtacg catgttgctc agaggcaaga gtatgaatat 360
gcctttgccc ctgactgggt tacttcggga gcctattgcc gacgcgattt cgatcgcccc 420
caacttaact ggctatttct gaacgggttg tccgatgac actatgacct ttacggtgat 480
ggcacgttac aatgtatttt caccacaggg cattcaccgg gccatcaatc ttttcttatac 540
cgcttaccgg gtggtacaaa ttttacgcta gcgattgatg cggcttatac cttaga 596

<210> 412
<211> 693
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 412
ccgttaccga tgttgattct gagccgcagc ccggccatct ggctgtggca aacgctgctc 60
tatcagggtga gtcacccgga tcgtctgcgc aacgtccata ctgccccgc cgatctgtcc 120
tgcgcgagc tggcccatcg gctggagaat gcgcccggc ttgagcggct tgccggcgaa 180
gccgccctga tccacggaaa acgggtcgtc gggttgaccc acgccgagct caaggatgac 240
ctcgccctgc tgcaagggca gacgataggc gagcaggccc aacgtctcgg attgagccag 300
aaaacgctct acaccacgcg gctggctggg gtgaaaaagc tgggtggaatg tcatccgcac 360
ctggcccccc gctttccgcg cacgctgctg ccgcgctcac ccgcaaacgc actgacggcg 420

tttgaacagg aatgggtaca agcgattcac gatcgccagg tcttcccggt ttttcaacct 480
 atcgctcgata gtcgctcaca gctacagggg gtggagatcc tgatccgctg gcgccaccgc 540
 ggcaggtac ttcaccccca gacctttctg ccgcacttcc gcgccgacta cacctggctg 600
 ctgcttacgg cctttgttct gcaggaggcc gtgcagaata ttaatgagta tccaggcacc 660
 ttctatTTTT cggtaacat accctcctca ctc 693

<210> 413
 <211> 514
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 413
 ccgatcatga gaacatcagt attgaactgc agcgtgagtt ccttcctgag gaacgtgaag 60
 attacgctca tgtcttctat agcggccctc ttgacgctt ctattcgtac cagtacggtc 120
 ggtaggcta ccgcactctg gatttcgaaa aatttaccta tcaaggtagc tatcaggggt 180
 gcgctgtgat gaattattgc tccatcgatg tgccatatac acgcatcact gagcataagt 240
 atttttctcc atgggaaagc catgaagggt cggctctgcta taaagaatac agtcgcgctt 300
 gcggcgagaa tgatattcct tattacccca ttcgacagat gggggagatg gctttactgg 360
 aaaaatatct ttctcttgcc gaaagtgaag aaaatattac cttcgtcggg cggtaggta 420
 cctatcggtg tcttgatatg gatgtaacca ttgcggaagc gctgaaaaca gccgatgagt 480
 ttttatcttc ggtggctaac caggaagaga tgcc 514

<210> 414
 <211> 584
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 414
 agagatgggc tgcaaactgc tgcagcgtag caccgcaag ctgctctta gcgatgccgg 60
 ggaaacgata tatcagcatg ccagcagat gctggaagcg gcgcgacagg caatggattc 120
 cgcaggcagt cgccaaacgg tcgcccaggg aaagctgacg ctaagcgctc cgaaagccgt 180
 cggccgcttt gtgatccacc cgctgatgat ggcgtttttc caccgctacc cgcaggtgga 240
 cgtctgcctg cggctggaag atcgccctct cgattttatc gatgacggta ttgatctggc 300
 gctacgcac accgataccc cctcccccg cctgcatggc aaaccgctga tgccaatcag 360
 gcacgttatc tgcgccactg aggcctatct acagcagcac ggtacgccgt acacgccgca 420

ggatctgcgc gcgcataget gcattagcct tggcgaaacg cccgccgatg cgcgctggaa 480
gttccgtcgg gaaggcaaaa cagaaacggt gcaaacctac gggcggtacg ccgccaacca 540
taccgccgta cgcctcgacg cggtcagaca gcatttaggg atcg 584

<210> 415
<211> 281
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 415
acagattaca ttgtcatthc ctgccagccg cgcctgagc ggccgagcgc tggcaggagt 60
cgtgggttca ggcgatatgg aagtacttta taccgccgca cagagcgcca cgctcaacgt 120
acagatcacc acctcagtgg ataacagcca ggcgcgctgg caggcgctgt tcgacagggt 180
gaacctgatc aacggcctgc ccgccgggca gttgattatc cagacttcg gcgccacgcc 240
gggcgctgcc cgtattcgta ttgaacagggt ttttgaggag g 281

<210> 416
<211> 656
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 416
atggatthtg cttatccgc cagctgttt agcgcgacgg taaaaacgcc gtgggcccggg 60
atcgtcgcgc agtcgccgt ggtgctggg ttgaccggcg cgatgtggat cacctatgcc 120
gcgatctact tcctcgccac cagcgtgttc aaacgcacgc cgcaggatgc cgcggtgctg 180
acctcaccg tcgccctgcc aaactatgcc gcgttaggtc tgccgatcct cggcagcgtg 240
ctgggtgaag gcgcgtcaac ctactgtcg gtagcgggtc ctatcgctg cggctcggtg 300
ctgatgaccc cgttctgcct gctgattctg gagcgtgaaa aagcccgcgc cgcgggtgaa 360
aacagcgggt ctacgctggc aatgctgccg gtgctgatgt ggcgttcggt gaaaaaacgg 420
atcgtctggg gcccgctgct tggggtggg ctttccgcga tcggcattaa aatgccggac 480
ctgctgctgg cgtcgatcaa accgctgggc ctggccgcca ccgccgccgc gctgttctc 540
accggggtga tcctgtcggc gcgtaaactg cagctcaatg cgtgatcgc tacatcaacc 600
atcgtgaaac tgctggtgca gccgtttatt gcctggggtc tgggtatggt acttgg 656

<210> 417
<211> 456

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 417

tatttacctt tcccggtcag ggcggccagc gtcccggcat gctggcgatg atccccgatc	60
gcgaggcgat cctcaccagc gcgcgcgcgc tgctggggga tgaagtcgat accctcgata	120
gcgccgatgc gctacaacac acccgtgcgc tccagctctg tctgctgac gccgggtgctg	180
cctgggcgcgc cgagctacag cgtcaggcgc tggatccgca gatggtcagc ggcctctcta	240
tcggcgcggt tccggccgcg gtgattgcgc gcgcgctcga ttccgccagc gcgctgcggc	300
tggtagccct gcgcggggac ttaatggaac aggcgtatcc tgaaggttac ggactgacgc	360
cgattatggg cctgaccgcg ccgcgggttg aggcgctgat gcaggccaac gaggtttatc	420
tcgccaatct gaacgccgaa acgcagttcg tgattg	456

<210> 418

<211> 537

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 418

tgctgctgat accaatgtag gcggcggcca ggttaatttc ttcggtaaag ttaccgacgt	60
atcttgact gtttccgtaa acggccaggg cagcgatgcg aacgtttatc tgtcaccagt	120
gactttaacg gaagttaaag ctgccgcggc ggatacctat ctgaaaccga aatctttcac	180
catcgatggt tctgactgcc aggcggctga tggcaccaa caggatgatg tgagcaaact	240
gggtgtgaac tggaccggcg gtaacctgct ggcgggcgca accgctaaac agcagggcta	300
cctggctaac accgaagccg ccggcgcgca gaatatccag ctggttctct ccaccgataa	360
cgccaccgcg ctgaccaaca aaatcatccc gggcgacagc acccagccta aagcggccgc	420
tgatgcctct gccgttcagg atggcgcgcg cttcacttac tacgtcggct atgcgaccag	480
caccccgacc acggttacca ccggtgtggt taacagctac gcgacttacg aaattac	537

<210> 419

<211> 554

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 419

cgcaatacca taccttcacc gccacgatg ccgtggctta cgcgcaacag ttcgccgga	60
tcgacaaccc atctgagctg gtcagcgcgc aggaagtggg cgatggcaac ctcaatctgg	120

tgttttaaagt gttc gatcgt cagggcg tca gccgggc gat cgtcaa acag gccctgccct 180
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 agacctgggt cgccactat cagcacagcc cgcagcacac ggtaaaaatc catcactttg 300
 atcccagagct ggcggtgatg gtgatggaag atctttccga ccaccgcac tggcgcgag 360
 agcttatcgc taacgtctac tatccccagg cggcccgcca gcttggcgac tatctggcgc 420
 aggtgtgttt ccacaccagc gatttctacc tccatcccca cgagaaaaag gcgcaggtgg 480
 cgcagtttat taaccggcg atgtgcgaga tcaccgagga tctgttcttt aacgaccgt 540
 atcagatcca cgag 554

<210> 420
 <211> 220
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 420
 gtgcgtttaa tctcctcaag ccagctcgcc agacgcgctt cggctctggc gaactggta 60
 tcctgatcca gcaccagccc aacaaagcgg tcgccttcca gcgcgagga cgcgctgaat 120
 tcataaccct catttggcca gctgccaatc atctgcgcgc cgcgcgcgct cagggcgctg 180
 aacagcgggc gcatcccgct gacgaagttg tccggatagc 220

<210> 421
 <211> 341
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 421
 aaattgccga agtcaatct ggtgaccggc tttgaaacct atctcgcaa cttccgcgta 60
 ttaaagcgga tgatggaaca gatggcggtg ccgtgcagcc tgctctccga tccgtcggaa 120
 gttctcgaca cgcccgccga cggtcactat cggatgtatt ccggcggcac cacgcagcag 180
 gagatgaaag aggccctga cgccatcgat acgtgctcc tgcagccgtg gcagctgctg 240
 aagagcaaaa aagtgggtgca ggagatgtgg aaccagcccg ccaccgaggt cgccattccg 300
 ctggggctgg ccgccaccga tgaactgctg atgaccgtca g 341

<210> 422
 <211> 400
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 422
 agagagcgtc attgagcagt ggggtgccgcc ggcgccgcgc ccggtccagc gcaatcgccg 60
 ggtcaatctg ctgggtcagcc atctctgttc gccgggcgat atcgagtggc tgcgccgatg 120
 cgtcgaagcc tttggtctgc agccgataat cctgccggac ctggcgcaat cgatggacgg 180
 ccacctggcg cagggcgatt tctcgccgct gaccagggc gggacgccgc tgcgccagat 240
 agagcagatg gggcaaagcc tgtgcagctt cgccattggc gtctcccttc atcgcgctc 300
 atcgctgctg gccccgcgt gccgcggcga ggttatcgcc ctgccgcacc tgatgacct 360
 cgaacgctgc gacgccttta ttcatcaact ggcgaaaatt 400

<210> 423
 <211> 536
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 423
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 gtactttatt tactgaccta cgcgtacata tcaggcgag catcgatagt gtgggatctc 180
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 tcgctgattc tgtgggcccgg cggcaaattg cccggttttc tcctctccgg ccttatcgcc 300
 gccaaattca ccctttttct cctgctgttc gccggtgccg caggaggcgt aaaagtactc 360
 agattactcg acttcgccgg cagcacgccg ctccagtatt acctgccgat cgtaccggtc 420
 tgcgttatcg cttttggatt tcatggcagc gtccctctc tgacaagaat gtaccggggg 480
 gataatcatc gtgcggtcct ccgctctctc tattacggtt tcgccgtttc attaac 536

<210> 424
 <211> 282
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 424
 aaaagacaag ctgttgctgt ttaccgccgc gctggtggcg gagcgtcgcc tggccccggg 60
 cctgaagctc aactatccgg agtcctggc cctgatcagc gcctttatta tggaaggcgc 120
 tcgggacggc aaaagcgtgg cctcgctgat ggaggaaggc cgacatgtcc tgaccgcgaa 180
 gcaggtgatg gagggcgctc cggaaatgat cccgatatc caggtcgaag ccaccttccc 240
 ggacggctcg aagctggtca ccgttcacaa cccgattatc tg 282

<210> 425
<211> 587
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 425
atttcataaa ctcgattgg tattttgatt tgcattggac cgaccgagca atagccgctc 60
gtgatgctgg ttatgagatt cacatcatta gtcattttgt tgatagtaaa ataaccaata 120
aattcaaatac gttagggttt atctgtcata acgttccgct tgctgcccag tcattcaacg 180
tattttacttt tattcgagca ttctttgatt ctcgaaaaat aattaaagaa atagaccggg 240
atctgctgca ctgcatcact ataaaacctt gtctaattgg cgggttcttt gcgaaaaaaa 300
cgcagcgctc agttattttg agctttgttg gccttggtcg ggtgttttcg gaaaattccg 360
ggcttattaa actactacgg cattttacaa ttaaagcata caaacatatt gcgagtaata 420
aacgcagtat gtatatgttt gagcatgata aagatagaag gaaaattggt gattttctcg 480
gtattgatat ccagaaaacc attgtcattg atgggtgccg tatcaaccog gaaatatata 540
aatattcggt ggaacaaaag cgagatatcc ctgtagtgct gtttgcc 587

<210> 426
<211> 320
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 426
aggttcagggt agctggaaaa acagtaagtc aagtacgaca agatattaca agccgattaa 60
ccacatatat tgaaagccct caagttgatg tcagcatagc tgcatcccg tcacaaaagg 120
tttatgtaac tggatgaagt gcaaaactctg gaaaacaggc tattacaaat attcccctaa 180
ctgtgatgga tgctatcaat gcggcaggag ggcttgccg tgatgctgac tggagaaacg 240
ttgttcttac tcataacgggt aaagatacaa agatttcatt atatgcacta atgcagaaag 300
gagatctaac ccagaatcat 320

<210> 427
<211> 280
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 427
tgattcaatt ttagtgatct gcacaggaaa tatctgcogt tctccaattg gtgagcggtt 60

attaagacgg ctattaccaa gcaaaaagat taattccgct ggggttgggg cattggttga 120
tcatgcagca gatgaatccg caattcgcgt cgctgaaaaa aatggtcttt gtctcaaagg 180
ccaccgtggg acaaaattta cctctgcatt agctcgacag tatgatcttt tactcgtgat 240
ggaatattct catctagaac aaattagccg gatagcacct 280

<210> 428
<211> 200
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 428
acatgatccc ggagaaatth agctggatta ttacttataa ccctctggcg agtatgatac 60
ttagctggcg tgagctattc atgaatgggg ttttaacta tgaatatatc tccatactct 120
atattacagg ctttatcctg accatcgctg gcttgccat ctttaataaa ttaaaatatac 180
gatttgcaga gattttgtaa 200

<210> 429
<211> 387
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 429
tggaaccagt gatcaatttc agtaacgtta cgaaagaata tcctctttac catcatattg 60
gttcaggat taaagactta gtctttcatc ccaagcgagc ttttcagctg cttaaaggga 120
ggaagtatct cgcgatcgag gatattcatc ttaccgtcgc caaaggtagg gcagttgcgc 180
tgattgggag aaacggcgca ggtaaaagca cttcgtagg actagtcgct ggcgtaataa 240
agccaacaaa aggctcggg actactcatg gccgagttgc ttcgatgctg gaactcggcg 300
gtggttttca tccagagtta acgggtcgtg aaaatattha tcttaatgcc acccttctcg 360
ggctgcggcg gaaggaagtt cagcagc 387

<210> 430
<211> 225
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 430
gggtgcatcc caaacctgct gggtcagcgc caggttaccg ttcagcttct ggccgtagct 60
cggcacaata gcgtgaatgc ggctctgcca ctccggcgag ttaaaactgct gcgggaacat 120
ctgcttgagc acgttcaggg tgattggcgc ggcggtggaa gccccggcg aagcgccgag 180

cagcgcggaa atggttttct gctgatcgac caccacttcg gtacc 225

<210> 431
<211> 690
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 431
cctgctgcta ttgctgtcgc tggtagccca ggaaaaccgc caggcgctgg ccggggtggt 60
acgcgagcag tggcagacct ggacgctgct ggcggtcttc tttatctatt acgccctcag 120
taatgtgtgg ggccatacgc cgcagcatat tgactcgcgc atcaccacac gcgtgtatct 180
gaccgggtat ctgttgctga tgacgatgct gctcagggac ggacgaaccc gccgactggc 240
gatgctggcg gtggtcggcg ggatcaccgt gctctccctg tggacgctga ttatcgacca 300
tacgctgggt ctcaccgaac gagcgtctc ccccgagaac cccggacca cgaacgttat 360
cgaccttgcc ggttactgcg gcacgcat tttaatctgc ggcatgctac tgaaagaaaa 420
agccagccac tggctctatc tgccggtggt catcatgctg gtgatgctgc tgctcaccca 480
aagccgcggg ccgatcatcg ccctggtgct ggcggtcggc tgtacgctgc acctgcacgt 540
cttcaccgcg cgcaacctgc tgatcgccgc ggcgctggcc gtgctggtag cgctgctttt 600
ggtcatgacg ccggtgggcg acatgtgct cgcccgtttc gaggagctgg gcacccaaag 660
cgggctgcgc ctgagcatct ggcaccatac 690

<210> 432
<211> 211
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 432
aatttaacct ggtttgataa gaaaactgaa gagtttaaag gggaagagta ttctaaagac 60
tttggatgatg atggttctgt cattgaaagt cttgggatgc ctttaaagga taatattaac 120
aatggttggt ttgatgtgaa aaatgagtgg gtttcattat tgcaacccta ctttaaacat 180
aaaatcaatc tttctgatag ttcataatctt g 211

<210> 433
<211> 326
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 433

ggggagaata tccttgtctt taaacgcgcg ctgggggtga ccaccgggat cctgccgtgg 60
 aacttcccgt tctttcttat cgcccgaag ctggcgccgg ccctgatcac tggaaatacc 120
 atcgtcatta agcccagcga atttacgccc aataatgcc a tcgcctttgc cgagattgtc 180
 catcagggtg ggttgccgaa aggggtcttt aaccttgtgc ttggccgcgg agaaaccgtt 240
 ggccaggagc tagccggcaa tccgaagggt gcgatggtca gcatgaccgg cagcgtggcg 300
 gcgggagaaa aaattatggc cgctgc 326

<210> 434
 <211> 465
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 434
 gactcgcggg tgattaacac cgggcagggt tgtaactgcg tcgagcgggt ctatgttcag 60
 caggaatat acgaccgctt cgtcaaccgc ctccgtgagg cgatgaaggc cgtccagttt 120
 ggcgaccgg cgacgcgaga tgacatcgcg atggggccgc tgatcaaccgc ggcggcgcg 180
 gaccagggtg cgggcaaagt gcgaagcggg ggcgcagggg gcgcgggtg cgctggcgg 240
 cagccgctg agggcaaagg ctatttttat ccgccgaccc tgctgctgga tgtacgtcag 300
 gagatggaca ttatccatga ggaaaccttc ggtccggtgc tgccggtggt ggccttttcg 360
 accctcgatg aggcgctggc gacggccaat gacagcgatt atggcctgac ctctcaatc 420
 tatacccgcg atctgaacgt ggcgatgaaa gcgattaagg gactg 465

<210> 435
 <211> 465
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 435
 atgaaacgac ctgattgcat tcgccactgg cgcgaactgg aagggccgga cgatgccact 60
 tatcccagaca gcccgagcgg tttttcgatt ggcgcgccgc tggggcgcg tttacgtctc 120
 aaccggttg ggatccacca cgacgcgact cgcggcgggc ggcgcacctc gtacccgcac 180
 gcggagagcg atgaggaaga gttcatctac gtgctggagg gctatccgga agtgtggata 240
 aacggctatc tctggaagct ggagccgggg gacagcggtg gttttccgc gggtagcggt 300
 atctgccaca cttttctcaa taacaccgag caggaggttc gtctgctggt ggtgggcgag 360
 gccacaaga aatacaaccg catctattat ccgctcaatc caggctatgc cgcgacgcgc 420

caggatcggtt ggggtgacca tccgccgcaa ttcttcgggc cacac 465

<210> 436
<211> 270
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 436
ttgcgtatat agaagtcata ccatcggtcg taagcggcaa cattgataga ttcagatgct 60
tccagaagcc gggggatata ataaaccagt tcttcaaagg caatactgcc ttgagggata 120
tcagaacggc tcaggcgaca aagaaggtta atcgtggctc gaaggatgat ccaactgctgt 180
gccggggagg atgggagggc gttcatgctt atcgggaagt catgaggaat taaagcaagg 240
atctgatttc cactggtaga cagctcacgc 270

<210> 437
<211> 406
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 437
gattcctgct ctgacaacca ttgttttaac catgaacgta gagtaacttc aggcacaggt 60
agcctggcat attgagatag catgtaggat agcataaaaa atattttgcc cttggatgta 120
aaaacgtttt ttaaacaaat cagaatagtt ctactctcgt tttattacca attatagctg 180
gcacgtcagc tccttgctca atgcggacct ttcgctcgat agcttgtcgc ctccgcgcca 240
gaagcgaaca gtgttatgag tggccagtga taaaacgtca gcccgttgac cttgccttac 300
agcacctcaa ccacttcaaa ttcttctcgc atcaactcca tatcttcaga aaaatgacct 360
tcagagctga aaaatctctg atgctctttc ttccagtatt caaggc 406

<210> 438
<211> 401
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 438
attgacggga tatctgacca gtcggggaat taaaaaacag gaaatcggtg aggtcaacaa 60
tgctgcggat ctgcagaaac actgtacgtc gtgttgcccg gcggtggtgt ttctgaatga 120
agactgtttc gtgcatgatg atgaaagtaa tggcattatt cgccagatca ttacgcaaaa 180
cccggcgacg ctgtttgtta tctttatgtc gctggcgaac atccatcttg accgctatct 240
gcgggtacgg aagaatctgc taatcagttc aaaatcgata accccaaaag accttgatgt 300

tattctggtt aattatctta aatacaaaaa caccagtgtg gggcagttaa ctttaccgac 360
attgtcactg agtaaaacag aatcaaatat gctgcaaatg t 401

<210> 439
<211> 450
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 439
cagcagcaag gtgtttaatg aggcggtggg ccgtcaggtg gaattcgtec aggacaacca 60
ttcccagtec cagaaacgcg tattacgcgg gttgcactat cagctggatc cgcacgctca 120
gggcaagctg gtccgctgtg tggaagggtga ggtgtttgac gtggcagtggt atatccgtcg 180
ttcatcgccct acctttggta aatggggttg agcgggtgctc agcgcagaga ataaacgtca 240
gctgtggatc ccggaagggt tcgcccacgg gtttatggcg ctgagcgaca cgggtgcagtt 300
tgtctataag ggcacgaact actacgcgcc gcagtcagaa cggagtatca tttggaacga 360
tccggagata aggattgact ggccggcact gagcgactgc gtgctgtctc tgcggagaa 420
agacctgcgg gcacatactc tggccactgc 450

<210> 440
<211> 380
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 440
ggggagaaag agaccctcac catcattgac gaccttcttt gggcgccac cggcgtgag 60
ctgctggcag actgcacggc gacggcaatc cgtgaaacgc tgcgtaatcc ggcgctggcc 120
ggcacgtatc acctggtggc cagcggcgaa acagctggtg cgactatgcc cgctatgtgt 180
ttgaagtggc gagagcgac ggtgccgagc ctggcgggtg aggaagtga gggcattccg 240
aacgacggcc tatccgacgc cggcgaagcg tccgctcaac tcgcgcctgt cgaattaaaa 300
atccagcagg cattcggggt gactctcccg gactggcgtc aggggtgtggc tcgcgtggta 360
acagaagtcc tgggcaaata 380

<210> 441
<211> 180
<212> DNA
<213> *Klebsiella pneumoniae*

<400> 441

agtaaattca ggctggctct ggtgcggcag aagtaccgcc cggacggcgg cgcagaacgg 60
 tttgtctccc gcgcgctgga agccctcgac agcagtcatt tgcaactgaa cgtcatcacc 120
 cgcgaatggc agggggccggt gaaaccggac tggcagatcc atatctgtaa cccacgtaaa 180

<210> 442
 <211> 689
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 442
 tcatttgaag aacgacacag aggttcggtt gaagatatca agaaccgcct gagtttttat 60
 ttacctttct tgtctcgtct gaaggatctt tatcccgaag gcgtgattgc ggatattggc 120
 tgtggacgtg gtgaatggct ggaaatcctg actgaaaatg gtattgcgaa catcggcgtc 180
 gatctcgatg atggcatgct ggcacgtgcc aagggaagccg ggctgaacgt gcagaaaatg 240
 gattgtctgc agttttctgca aaatcaagca gaccagagtc tgatagcgtt gactggtttc 300
 catattgctg agcatttgcc ctttgaggta ttgcagcagc tcgtcatgca taccttacgg 360
 gtgctgaaac ctggcggttt gctaatacctc gaaacgccga acccggagaa tgtaagcgtc 420
 gggacctggt cattttatat ggatccaacg cataatcacc ctttgccgcc gccattgctt 480
 gagtttttac ctattcatta tggttttaac cgggcaatta ccgttcgtct acaggaaaaa 540
 gaggtctctca aatccccgga cgcagcgggt aatctggctg atgtgcttaa aggtgttagc 600
 cccgattaca gcatcattgc tcagaaagca gcgcctgcag atgttcttga acgctttgaa 660
 accctgttta cccaacaata tggcctgac 689

<210> 443
 <211> 581
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 443
 tgctcttatt atccaacctc tgcattgctg taaagcaaac tcttataatg atattggctg 60
 tgcaggatgat gatactggag ataatatctc gtttaaaaaat ccattctact gtgagctgac 120
 ggcccattac tgggtatgga aaaatgaatc tctttccgat tatgtcggct tcatgcatta 180
 tcgtcgacat ttaaatttct ccacgcagca ggatcatgcg gaagataact ggggggtggt 240
 gaattatccg ctaataaacc cggactacga ggcacagttt ggattaaccg atgacgctat 300
 tcgtacatgc gttgagggga gtgatctttt actacctaaa aaatggctcg taacatcggc 360

tggcagtaaa aataatctcg accactacag caagggtagag tttttacata ttaaagacta 420
 caaggctgcg ctagaggttg ttgaagaact ttatccagaa tataagacag caatacagca 480
 gtttaataat gccactgatg gttattatac aaacatgttt gttatgcgca aagatatgtt 540
 cattgattac tcagagtggg tgttttagcat tctggatcgt c 581

<210> 444
 <211> 649
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 444
 ggtttaaggc aggtagtcag catattttgtg atgcgattga tacggactgg gttttctttt 60
 acgatgatga tgcttttcct gccagcgata tactggaaaa gttttttgct cttgaaaaaa 120
 aggaatgtca ggtctttact ggttttagtca aagatcttca cggccaccct tgtgcaatga 180
 atcttccttt caggaaagta ccttcacott ttgctgatac tttacgttat attcgcaccc 240
 cccaacgctt tgttcctacc attgacgaga gtgtcatggt tgagacagtt tcgtttgttg 300
 gcatgattat tagcagcaaa gtattgcaag agcatattga tcacatccat gatgaactgt 360
 ttatctatatt tgatgatctt tattttggct atgcgttgac attggacggg caaaaaatcc 420
 tctattcacc agaactgatt tttcatcatg atgtcagtat ccaggggaaa atcatctctc 480
 cggaatggaa ggtatattat ctgtgccgaa atttaatttt ggccaggaaa ctattccagg 540
 aagtaaaagt atttagcaat ttctctatcc ttatacgctt atgtaaatat ttatccatat 600
 tgccatggca gcgcagaaaa tcatcatatc tgtgtttcat gtatcgtgg 649

<210> 445
 <211> 606
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 445
 gtggcattgg tcgttatagt attgctatcg ccagagcgat tattagaaat aacaatcgac 60
 atgaggtttt catcgcgcta tccgctatgc tgggtgagtc gattactgat gttaaggcgc 120
 aatttgctga tctccagcca gcagacaaca tagtcgtctg gcatgctgca ggaccagtac 180
 gtgcaatgga taaaggtaat gaatggcgtc gggagagcgc agaactgatt cgggaagcgt 240
 ttcttgaatc attgcgtccg gatgtcgttt tcattacaag cttgtttgaa ggtcatgtcg 300
 acgatgcggc cacttcggta caaaaattta gtcgtcagta caaagtagcc gtactgcac 360

acgatcttat tcccctggtg caggctgaga cctatctgct ggatgatgta ttcaaatacct 420
 attatttaca gaaagtggaa tggttaaaaa acgctgacct tctgctaact aactccgctt 480
 atacggcaca ggaagcgatt gagcatctgc atttgcaggg cgaccatgtg cagaatattg 540
 cagctgcagc cgatcctcag ttttgtatgg cggaagtgc agcgagcgag aaagagtccg 600
 tccttg 606

<210> 446
 <211> 450
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 446
 tgacctatca ctcgatatt gtgaaacaaa aacggttaat gaagttgtac cagccgctgc 60
 aggagcgatt cctcgccagc gtagactgca tcgtcgctc gtcgccaac tacgtggcct 120
 ccagccagac cctgaaaaaa tatcaggata aaaccgtggt gatcccgttt ggtctggagc 180
 agcatgacgt gcagcacgat ccgcagcggg tggcgactg gcgggaaacc gtcggcgata 240
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 ccgccgaacg taaccggctg ccggtggtga tcgtcggggg cgggccgctg gatgcggaag 360
 tgcggcgtga ggcgccacag cgcgggctga gcaatgtggt gtttaccggc atgctcaact 420
 acgaagataa atacattctc ttccagctct 450

<210> 447
 <211> 507
 <212> DNA
 <213> *Klebsiella pneumoniae*

<400> 447
 ttcaggcgaa atgctatgct cgcacgcgg acttcaaaaa gcaggggacc acgctgctgc 60
 tggtttccca cagcgccggg gatatcgta agcactgcga ccgcgccatt ttcctcaaaa 120
 atggtgacat ctgcatggac ggcaccgccc gcgacgtaac caaccgttac ctggatgagc 180
 tgtttgga accggataaa gacagcgcga caaaaagcgc aacggctatc tcgtcagcca 240
 gtggcgaaag ccagatgtct ctcatgaga ttgaagatgt gtaccacacg cgcccaggct 300
 accgtccgga agaatatcgc tgggggcagg gtggcgcgaa aatcatcgat tatcatatcc 360
 agagcgccgg ggttgatttt cctccctcac tgacgggcaa tcagcagacc gattttctga 420
 tgaaggctgt gtttgaatac gattttgatt gcgtggtgcc tggcatcctg attaagaccc 480

tcgatggctt attcctctac ggaacca

507

<210> 448

<211> 678

<212> DNA

<213> *Klebsiella pneumoniae*

<400> 448

gctatgaact gatcctggtg aacgatggtt cgacagacaa cagcctggcg gtgatcgccg 60

aatggcagga gcggctgcag aacgtccagg tgctggagca ggaaaaccag ggctgtctcg 120

tcgcgcgcaa taccggcctc gccgccgcca gcggcaaata tctcgcgttt ccggatatcg 180

acgacaaaact ctatccgggc atgtatcgca cgctgctgga gatggccgag aaagaacatc 240

tcgatatcgc cacctgcaac ggcacctatg tgtacgaaaa gcgccgcgag agccaccgga 300

tcttccact ggatcgctg ccctcgacgg gtgtgctgcc gggccatgtc tggcttaagc 360

aggccctgga ctgcggaag tttctgcacg tcacctggct taatatattat cgtcacgact 420

ttatccgcca gcatcacttc catttcgagc ctggcctgcg ccatcaggat atcccatgga 480

ccacagaagc cctgctggcc gcggagcgcg tgcagtacac cagtcagcag ttctatgatt 540

actacattca ctctgagtcg gtgtcgcata agccggacaa cgacgacacg ctgatgcgtt 600

cggcgcgcca ctatatgaag attctggaga tgctggaggc gattaaccag cgctaccggg 660

ataaagtacg ccatatcg 678

<210> 449

<211> 585

<212> DNA

<213> *Klebsiella oxytoca*

<400> 449

ctctgcctct attgctcttg ctctcacagc gcccgtagat tcatttgcag ccagcgatca 60

gcgtgggtac aaacctgaag acgtcgcttt tgatgaaagt ttttttctgt ttggtggcca 120

tgtagggact tctgttgaat atgaagataa ggtaactcgt ggtttcaata acacggataa 180

aaaggagaag acgattacca atgaggtttt caactttttt tataacaatc cacaatggaa 240

ttttatgggt ttttactctt ttaaaataga aaatagagag caaaaggagc ctggttatta 300

tgagaatgaa gatggtatta agcagctttt ttcatagaat aaagggtcatg atcttggtaa 360

cggttgggct actgggttaa tttatgagct agaataatac agaagtaaag tttattctcc 420

ggatgttagt ggtctacgta aaaaccttgc cgagcacagc attagacat atttaacct 480

ctggaataat gattataata tgggattcta ttctaattctt gaataccttt tgagtaaaga 540
agatcgcaat gcatggggga aaaggcaaga gcagggatat agtgc 585

<210> 450
<211> 340
<212> DNA
<213> *Klebsiella oxytoca*

<400> 450
tatcgatgcg gatgaaaatt gcccaactac atcgtttctct gaaagaggag gggcatcctg 60
ctacaatgat ttatgttact cacgatcaga ctgaagcgtt aactctagga gatcgcatctt 120
gtgttcttaa ccatgggaat atcatgcagg ttgatacacc tactgatctt tataattatc 180
ctaataataa gttcgttgcc agttttatcg gttcaccatc aattaatttg atagatactg 240
ctatccgtaa gaataatgag aggttgatg ttgaaattgc tcctggcggt gaaatattaa 300
ttccacatag taagcaagtg ttgcttgaag gttatattaa 340

<210> 451
<211> 608
<212> DNA
<213> *Klebsiella oxytoca*

<400> 451
atccaatgac cagaaatgag ctgcgtagcg cccataataa gaaaagatgc cggaatata 60
cgcatgcttt ttccctcaga caataacata gttactcctg aaatttgatt tgctcatcaa 120
tgatattacg agcacggtca agtgctgctt ttggcgtttg gtcattgatc cacatatcgg 180
taatcgcat tgcagtgagg gaccataaat aaccatttc cggaatagat ggcattggcat 240
cagagtgaag cccttggtta ataattgcgc tcgtcgcttc atttgcagtt ggtaggattt 300
tgttcatcag attcggtacc ggaggtatag attctgtcat ctcatagcgt ttcattaaca 360
tttcatcaga tgagagatag tcagcgaaaa gttgtgccgc cttaggcgat ttactataag 420
aagagacgac cgccaggcga accgtagaaa acgaacgtgg ctgttttcct tcaagagtag 480
gtatgggaac aacgcacaaa ttaattttac tgttggtata tccctggatt gcccatggac 540
cgtcgatgat ggcagctact ttgccttcag aaaataagcc tcgacgcacc tgtggattac 600
gcataatct 608

<210> 452
<211> 589
<212> DNA

<213> Klebsiella oxytoca

<400> 452

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cgtaaatatg ggacaaaagg ataaaccggt aacgccaaga tcttgcaaat aatcaagttt    60
gttaataatg ccctgcaaat caccgccc ataaagttttt gaatctggag gcgttcccca    120
cggttgtacg ttttctggcg atatcgatgg atcgccattg caaaatcggt caggaaagat    180
ctgataccat attgtttttt taaccatttc tggcgtagaa agtacatcac ctggattgat    240
ataaggaag caaaaaaagt tggacaagtt actcagttct gtctctgcta cagggtggtt    300
acttatatca acacagcgtc gttcaccaaa taataatttt tccccgttat ttccgtataa    360
tataaaacca tagcggctac gtcgtttgca cggagtaa atgcggcaaac agtggtcata    420
gctctcgctt tgtccctctt tttccatgtg aacttcgttg ccgccgctcc atccatgcgc    480
gtcgtcgccg ccaaggtttc caccatctag gccaccttcc tccattgat agggatcgcc    540
gatccacaga gagactttcg cgacctcgcc tttgactgtg cgaaatcta    589
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<210> 453

<211> 528

<212> DNA

<213> Klebsiella oxytoca

<400> 453

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gcaagggtag aggtgtattg cgccttttcc ttattagcca tcgccgcac ataggcaaaa    60
cgatattctt cataatttaa gcgaattatt tctggtagat aattatttg acagtgtcgg    120
cttaatacac tttttagact taacggaaag tctgagtgtg ttgttgctaa tccactgagc    180
actaacaatc taggttttaa aaccattatt ggatcaagta aggtcttggc tagttgatcc    240
atccacattc ggtagacttt ttgcgccc atcactgc catcaactcc ctgaattatt    300
tctaaggcac tcttccgctg aagagagaac tgaaaatact gtctttcgat cccggatgtc    360
gaaatgaatt gatgaacgca tcctatcccg cagcattcgc aaaccggaga tataccatca    420
atgagtggct gataattttt caatgggaga tgagcccagg aaacatttat tgcattgtca    480
aatacgctat catcgttgta tttatcgact acacaaagtt cacagcca    528
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<210> 454

<211> 510

<212> DNA

<213> Klebsiella oxytoca

<400> 454

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ataagccatg tggtttcttc cgatgggaaa gcattagagc atttttcata tcaatcacta    60
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gcatgaagcg atgtgatgga taaatctttt catctatttc aaatcgagag tacaattcga 120
 tagattcatg tggtagcgcg agtcggttaa atgagaacac gataatccga accccgcgct 180
 caacggcatt aatgagttct tgagcaatga gttcaagatg gaagtcagtg ttcaggtaaa 240
 cttcgatttg agccagttcg agcattttctc tggctttttg tagtgaatta tcaaaaccag 300
 agacgttata tatgaactct ttctcttcct gtagcatcat acgtgagagt tcttttttta 360
 atacattgat gttttcaatg gtttgctttt ctatgttgct gaaaataagc tcgggagatt 420
 ttgcttgata ctcttttagta ttgccatcgg ccataaaaat gaagccattt ttatatagac 480
 tatcaattga tgagtagacg ctagaacgtg 510

<210> 455
 <211> 383
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 455
 gccggtaatc ttgagctgct ggcccagggc cgtagcgtgc gcgtggatgt ggccgccggc 60
 gccgaagcca tcatgaaagc ggtcgacggc tgcggcaggc tcgataacgt caccggcgaa 120
 tccggcacca atatcggcgg catgctggaa cacgtgcgcc agaccatggc cgagctgacc 180
 aacaagccga gcagcgaaat atttattcag gacctgctgg ccgttgatac ctcggtaccg 240
 gtgagcggtta ccggcggtct ggccggggag ttctcgctgg agcaggccgt gggcatcgcc 300
 tcgatggtga aatcggatcg cctgcagatg gcaatgatcg cccgcgaaat cgagcagaag 360
 ctcaatatcg acgtgcagat cgg 383

<210> 456
 <211> 400
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 456
 cctgctctat tccgtcagga gttttgccgc cgcgatgctc gcctattacg ttgccctggc 60
 gattggcctt gaacgccctc atggggactc atcaccgtct acatcgtgtc gcaaacctcg 120
 gtgggcgctc cctgtgcaga agcctttatc gcctggccgg taccgtggcc ggcgcggggg 180
 ccacggtatt gattgtgcg acgtttgtga atacgccaat tctatgtagc gtgattctgg 240
 ctggctggat caccttctgc ctctatttat ccctgcttga acgcacgcc cgcgccatg 300
 cctttgtgct ggccgggttat accgcaagcc tgattggttt tcccgcgctc gccgatcccc 360

gcacgtgttt aacatcgccc tcatccgggt acaggaaatc 400

<210> 457
<211> 535
<212> DNA
<213> *Klebsiella oxytoca*

<400> 457
ggctgtctgc tatggattta ctctgcctgg cccgatggcg gcacggcggg gtcgattctc 60
ggggtttget gcacgtgtt tggcagtttc gacacgccgg ccccgcatat tgtgaaatat 120
attatcggct ctgtctgggg cgtagtgata agccttatct atagcttcgc cctgcttcct 180
ccgctcagcg atttccccgt gctgggtggcg gtgcttgccc cggctctatct gcttgccgga 240
tcgctgcagg cgcggccccc cagcaccttt atggccatgg ggatcacctt gacgctgccg 300
gtactgtgcg agctgggcgc gcgctacagc ggcgacttcg ccgacgcggc caacaccgcg 360
atcgccctgt ttttcgcgac cggctttgcg gttatcggca tgagtctgct gcaaaccgta 420
caggcgagcg cggcgataaa gcgtctgctg aaactgtgcc aacgcgatat tcgccgcagc 480
gtgagcgcgcg tatttaaagg cgatgaaacg cactggacca atctgatgat cgacc 535

<210> 458
<211> 400
<212> DNA
<213> *Klebsiella oxytoca*

<400> 458
tggcgtttat tttctgaaa cagtatgcgc agacgccctg gacgcgcgat ggccgggttc 60
gggcagatgt ggtgcagatt gcgccggatg tttccgggcc ggtgagcagc gtggcgggtgc 120
gggataatca gtgggttaac cgcggcgatg tgctttatgc catcgacccg cgctggctga 180
agctggcggg gctcagcgcg caggccgacg tcgaagcaaa acgtcatgaa atgctgatgc 240
gccaggatgc cgccccgcca cgcgcgctca tcaaaggggt catttccggc gaggatatcc 300
agcaaacagg cagcgcagct gctgttcgcg gcggccaatt atcagggggc gctggctgcg 360
ctggaactgg cgcagtgaat cttatcccat gcaacgctac 400

<210> 459
<211> 260
<212> DNA
<213> *Klebsiella oxytoca*

<400> 459

cgttctcccc tgattcttgc cggcaccg ggaacttaca gctatgcagg aaccggtaac 60
 gtagtagcga tcgctcgcga tctggctaag atctgggata ttcctttagc agtccacctc 120
 gatcaccatg aagatctggc cgatatcacg cgcaaagtac aggccggtat ccgctcggtc 180
 atgatcgacg gatcgcattc gccttttgaa gaaaacgtcg cgttagtcaa gagtgtggtt 240
 gaactgagcc accgctatga 260

<210> 460
 <211> 456
 <212> DNA
 <213> Klebsiella oxytoca

<400> 460
 cggcgcattht aaaatatcaa tcggttgatt taaatgaagt gatcacgcat tcgcttcaac 60
 tggtttagcca ggatgccgcc agccgggcaa tatctctgac gtttaccgag cagcccgagc 120
 tatgccgcat ccaggccgat ccggtatggt tgaacaggt gctgcttaac ctttatctca 180
 atgctgtcca tgccattggc cgcgagggcg tgattacggt ggcggtgagg gagtgcggcg 240
 atgggcgagt caaggtgagc gttgctgaca gcggcaaggg aatgacggcg gaacagctac 300
 aggccattht cacaccgtac tttagtacca aggcggacgg caccgggctg ggcctggcgg 360
 tgggtgcagaa catcgttgag cagcacggcg ggacaattga cgccgagagc gccccggca 420
 agggcgcgct atttacgttc tatttgccgg ttaatg 456

<210> 461
 <211> 536
 <212> DNA
 <213> Klebsiella oxytoca

<400> 461
 tattgaaggc accaccagcg acattcgctt cgtccacaac gttctgttcc cgtacgcccg 60
 cgaacgcctg gccggtttcg ttaccgctca gcagtttgct gagccggtga agaccattct 120
 cgataacctg cgcgaagaga tcgccagcc ggccggtggc gccgaagaac ttattgctac 180
 cctcttcgcc tttatggatg aagaccgcaa atcgaccgcc ctcaaggcgc tgcagggcat 240
 tatctggcgc gatggctacg ttcattggca ctttaccggc cacctgtatc cggatgttct 300
 gccggcgctg gaaaaatgga agtcacaggg tattgattta tatgtatatt cctcaggctc 360
 cgttgctgag cagaaattgt tatttggtca cagcgatgaa ggtgatatta ctcatctgtt 420
 caacggctat ttcgatcccc tggtaggtgc caagcgtgaa gcgcagtcct accgcaacat 480

tgctgagcaa ctgggacagc ctctgccgc catcctgttc ctgtccgata ttcac 536

<210> 462
<211> 557
<212> DNA
<213> *Klebsiella oxytoca*

<400> 462
cctggagtgt gcataagggc tggcatcgcg acggtaaact gcggatgggtg ccggtcgcgc 60
cgcaacctac ccgggcgacc accgatgcgt tctatccgct gatcctcaac agcgggcgga 120
tccgcgatca atggcacacc atgaccgcga ccggcgcggt gccgcgtctg atgcagcata 180
ttaacgagcc ggtggtggag gtcgcgcgcg cggacgcgca gcgttatcac ctgctggaag 240
gtgaactggc gcgggtccgc tcaccgaagg gggatgatgt cgcaaaagt acgatcggcg 300
acgggcaacg gcccggtcg ctgtttgtgc cgatgcactg gaataatcag ttgctcgtc 360
agggacgggt gaacaacctg ctggctgcgc tcaccgaccc gcactccggg cagccgaaa 420
gtaaacagac ggcggtggcg atagccacct ggcttcctgc gtggaaaggc gagctttttt 480
cgcgccagcc ggttccgctg cccgcttcgc tgactggcg gcggcggcg gcgcagggca 540
ttatccatct ttcgctg 557

<210> 463
<211> 231
<212> DNA
<213> *Klebsiella oxytoca*

<400> 463
acacgcatat aaaccgcaac cgccggccag cgccgataaa gcgcccggcg aaattattac 60
cctgccgcgc ctgcaggtgc gcaaaaccac gcctccgctc agccgctggc tgcgcgatgt 120
taccacacgt cttctgccgc cgctgctcgg gctgggattg ctgctgctgg gctggcagct 180
ggcggcgatg aacagcaaag gtttcccgc gccgctctcc acgctggatt c 231

<210> 464
<211> 459
<212> DNA
<213> *Klebsiella oxytoca*

<400> 464
gcgataagtt ttcgatttca cggcgacgtt tattacagac gggggcggcg ctgggcggcg 60
cgatgctgct ccccggcata atgcaggcgg cgtgggcggc tgggtcggat aaaccggaac 120
agaccaccgt gcgggtgggg ttattccgc taaccgactg cgctccctta gccattgcct 180

ccctgaaggg gttcgataaa aagtacggta tcacctcgt gccgagcaaa gaggccagct	240
gggccgcggt gcgcgacaag ctggttgccg gagagctcga cgccgcgcac attttgtacg	300
gcatgtctta cggcctggag ctggggatcg ccagtaaacc gcaggcgatg gccaacctga	360
tgaccttaa ccgcaacggc caggcgatta cgctctccag cgagctgcag gaacagggcg	420
tcaccgacct gagcgggctg aaaaaacgga tcggtcagc	459

<210> 465
 <211> 594
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 465 atgtcatggt tccgatactg tctgccgatg aaaacagcct ggtgctggtc tgggaaaaac	60
cggagtctga gaccgagcag gtggtggact acgccgtcta tcgtcaaggc gagcggctgg	120
gcctggcgcg tgaaaaatcaa aaccattttt ccccgcaaa gccctatatatt gataacttct	180
atcagcggat cgccagcgac ggctggcagc agaaaaatcga tctgcgcagc ttcacggcca	240
ccaacctgca gccgatacag gagtatgcct ttacggtgag cgcggtctac gccaatggcc	300
aggaatctcc ggacagcgcg gtggttaaag cgcaaacccg caaacgccg cacgtcatcg	360
aagccagcac attcggcgcg aagggtgacg gcaccacgct gaatacccag gcgctgcagc	420
gggccattga tagctgtacc gtcacgcaact atcctcaggg ctgcaagggtg ctgatttcg	480
gcggcgaatt caaaactggc gcgttggtcc tgacacagcga tatgacctg gatattgcgg	540
ctggcgccac cctgctgggt tcggacgac cggccagta tccgcttgat aaag	594

<210> 466
 <211> 625
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 466 aagctggaac gtactaacga cggatttatt acctcatggg cggcaacggg cagtaatgaa	60
tgggtaagcc agcgggttcc tcacgccgat ctgattgtc agcaggataa agaacattac	120
tacgtcgggt tcttcgcctc acgtaacgcc aaaatcacccg tcagcaatgc ttccctgacg	180
acctccgcgg caaatacgggt tccctccgcc ccgtatgttg ccaaaagctg gccgccggtc	240
atgcaaattg cctcggggac aaaaagccag agcaaagagt atctcctgca ggcgcgacg	300
aatagtgacg gacgcatcac cgtgcgtcag gatgaagtgg tgatcgggca ggataaagcc	360

gtgaaggccg gagagatgta taccagcct gccgttctga aagataaaag cacattcgaa 420
attagcttca ctccagccac cggcgcaaac acgctgaccc aaacgctgac ggttgaacag 480
agcgccaatg tgacaggcaa tacgctgtac gccgcgccg atgggctgtc gcaggctaaa 540
gggacgacgg actcgccgct ggatttagcc accgctgtcg acctcgttcc ccctggcggg 600
caaattgtat tagccgcagt gatta 625

<210> 467
<211> 503
<212> DNA
<213> *Klebsiella oxytoca*

<400> 467
acaggatagc gaacacctcg atattctacg ccagcttacc catgcatga gcgacgagcg 60
cgtacctgaa gcgtatcagc gcacccccag agctccgcag gcggtgctgg agattctggc 120
cgggatatct ctctgcccga gggggaagat atggaccgcc tccggtgata cgatgaagag 180
gcgacgttta ccctacgcga atccccacgg actgcacgcg cggccaagcg cggctctggt 240
gaaagcggtg aagcagtggc gatcgcaaat tcgggtggaa aatctcgaca cccgttccgc 300
tattgttgac gccaaaaatc tgatgcgggt cgtttctctc ggcgaaaagc aggggcatcg 360
gctgcatttt atggccagcg gggaagatgc ccatcaggcg ctggaggcta tcggtacggc 420
ctttaatgcc ggattaggcg aaattgccgc acagccgcag caggtcgttc agccagcaga 480
aaagcctaaa cgagctggc ttt 503

<210> 468
<211> 534
<212> DNA
<213> *Klebsiella oxytoca*

<400> 468
atccatcccc tgacactcaa tacggcaatc gatatgaata tgttttgca tccgctgaag 60
ccgtcggcag tgaaccgaac ccgacacacg gaatattgcc caaatggtaa aggagtgaac 120
gtatcgctga tattaatatc ttatcagcag ccactcaca ttataggtat tttcggtggt 180
ttcactggcc gttatattgt ggaagagtta cgtcagaaaa aaattaaagt gacgccggca 240
tgggtctctg agccaccag aattaatatt tttattaatg acggcgctga ggaatataag 300
ctcgttaatc ctggagcaaa aattgatgat gagtgtaaac agcaggttat tcatcatctg 360
caatgcgtcg cctctggtga ttatttagcg atcagcgga gcctgcccc ggggattgaa 420

agccgatttt atgctgaaat tattgaatta tgccagcaga aaaggtgtga agttatcctc 480
 gatatacagcc atccggtcct gcgccagctg cttgaattac ggcctttgtt gatc 534

<210> 469
 <211> 599
 <212> DNA
 <213> *Klebsiella oxytoca*

<400> 469
 gcttcaggtg ttgaaaatgc gattacgccc gcggatttaa aagatattha tggcggttatt 60
 attgccgctg ataaagacgt taacgccgag cgatttaatg gtctgccggt cattgaagtt 120
 ccggttaaag aagccattca ccatccggcc gacttaatta ataaatttat cagcggccag 180
 gcggcgcgtc gtcagggtat ttctgcctcc gccgattcaa cgagaaaatc cgagcgggag 240
 tttttcgggc ccaaggtata taagcacctg atgagcgcg tctctaacaat gctgccgttt 300
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 ccaaactcgc cgcaatataa cgttatcgcc gccacgctaa tgaaggtggg gtcaacaggg 420
 ctttctcaat tcatggtgcg gatthttcacg gcttatatgg cctggtctaa ttccgggcgt 480
 cccgtaatg gtgcgcgggc tttgtcggtg ggctataagc caaacgcaac cgcgcgacag 540
 gctttttctg gcgggattat cgccgggtct cgccgccggg gttatthttat gctgctgct 599

<210> 470
 <211> 675
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 470
 caagcacaac aagaaatacg tcgtcgccct ggaccagggc accaccagct cccgcgccat 60
 cgtcttcgac cgcgatgcca acgtggtcag ccaggcccag cgcgagttcg ccagttcta 120
 tccgcaggcc ggctgggtcg agcacgaccc gatggaaatc tgggccacgc agagtctgac 180
 cctggctgag gccctcgccc aggccagcat cgagcgcgac caggtggccg ccatcggtat 240
 caccaaccag cgcgagacca cgggtggtctg ggaccgtcac agcggtcggc cgatccacaa 300
 cgtcatcgtc tggcagcgcc ggcgacgcgc ggcatctgc gcgcagctca agcgcgacgg 360
 gctggaagac tacatccgag aaaccaccgg gctggtcacc gatccgtact tctccgggac 420
 caagctgaag tggatcctcg acaacgtcga aggcgcccgc gaacgcgcgc gcaacggcga 480
 cctgttggtc ggaccatcg acacctggct gatctggaag ctaccgaag gcaaggtcca 540

cgtcaccgac tacaccaatg cctcgcggaac catgctgttc aatatccaca gccgcgactg 600
 ggacgcacgg atgctcgagg tgctcgacat tccccgctcg atgctaccg aggtgcgcaa 660
 ctcttcggag gtcta 675

<210> 471
 <211> 630
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 471
 gagcgacctt ggattctcga agatcctgtt cggcctgttg cctaaggaca gccaggacta 60
 cgagaacgcc ttcacgctcg gcaactaccc ggccgccttg cgcgagcatt acgaccgggc 120
 tggctacgcg cgggtcgacc cgacggtcag tcaactgtacc cagagcgtac tgccgatttt 180
 ctgggaaccg tccatctacc agacgcgaaa gcagcacgag ttcttcgagg aagcctcggc 240
 cgccggcctg gtgtatgggc tgaccatgcc gctgcatggg gctcgcgcg aactcggcgc 300
 gctgagcctc agcgtggaag cggaaaaccg ggccgaggcc aaccgtttca tggagtcggt 360
 cctgccgacc ctgtggatgc tcaaggacta cgcactgcag agcggtgccg gactggcctt 420
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 gtgcgccatc ggcaagacca gttgggagat atcggttatc tgcaactgct cggaagccaa 540
 tgtgaacttc catatgggaa atattcggcg gaagttcggg gtgacctccc gccgcgtagc 600
 ggccattatg gccgttaatt tgggtcttat 630

<210> 472
 <211> 324
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 472
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 cccagcggg ctgatccgc ccaccaggta gccggtggcc cgctgcgcg cctgcggatc 120
 ggccatgtcg gccttcttcg cccccgccg atgggccagg gccttcaggc cgagactgcc 180
 gatcaccggc accaccgcca ccagcaactc gcccttctcc gtggcgcgga gcagcgtctt 240
 gaacaccgc tgcggttcca ggccgagctt ttccgcggcc tccaggccat aggaagggtg 300
 cttggggtcg tggctgtagc tgag 324

<210> 473
 <211> 669
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 473
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 tccgcccaag ccttgctgta ccatcgtggt gcatggcgtc aacgatctcg cgggttgcta 120
 cgaacggatc gagcgagggc tctgccaggg gctcaatgaa cgcctggaca tgccgccgac 180
 cttgcccggc gggcaggcca atcccggcta cctgacgcgc gcgggtctaca gcctgccggc 240
 ggacgacgaa ggcaaggcag agaaccgccga cgtcgtctac taccggcgca agttcgccag 300
 tggcgccggc ggggccgcgc tacgcagcgt agtcgtacct ttctactggg gttccgcga 360
 ggaagagcaa tacatcaaca agaccgcggc ccacggcgaa tggctggacc gcaacggcaa 420
 ccggctggac aagtccggca ccaaggaagg cgggcagttc gtcaatgccca ccaccaacct 480
 gccggacatg tggggccagg gtttcaacgg caagctgttc ggtttcatct cgctggactg 540
 gttcggcggc accatgaccc atccgctggt ttcggcgga gggcgcaagt acatggtcct 600
 tgccggccatg cgcctggcca tgttgatcaa gatcatccgc aagcgttacc cggacgacac 660
 catcaatgt 669

<210> 474
 <211> 810
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 474
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 cctggctggc gcgtgtccg ccaggtgctc caccaggaa gaaatcctcg atgcggcact 120
 ggtcagcggg gattcctgc aactgaccga cagccacctg gtcgccctgc gcctgcagca 180
 gcaggtcgag cgcacccgcc agaccgcac ccagttgctc gacggtctct accagaacct 240
 cagccaagcc tatgatcctg gcgcgccag catgtgggtc ctgccggcca acccgacaa 300
 taccctgccc ttctcatcg gcgacaaggg gcgcgtgctc gccagcctga gcctggaggc 360
 cggcgccgc gggctggcct atggaccaa cgtgctcacc cagttgagcg ggaccaatgc 420
 cgccacgcg ccgttgctga agcggcggt gcagtggctg gtgaacggcg acccgggcg 480
 ggccactgcg aaggacttca aggtcagcgt ggtcggggtg gacaagaccg ccgccctcaa 540
 cggcctgaag agcgcgggcc tgcaaccggc ggacgccgc tgcaacgcgc tgaccgacgc 600

cagttgcgcc agcaccagca aattgctggt actgggcaac ggcgccagcg ccgctagcct 660
 gagcgccacg gtgcgcgcac ggctacaggc cgggctgccg atcctcttcg tgcacaccaa 720
 tggctggaac cagagcagca ccggccagca gatcctcgcc ggcctgggcc tgcaggaagg 780
 cccctacggc ggtaactact gggacaagga 810

<210> 475
 <211> 524
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 475
 aggagcaact gaagcgactc ggcacgcagg ccagggccgc ggcgatgcc tacgctcgac 60
 tgggcgagat gcagcgtggc ctggatatgc aggtccgcgg cctgcaacgg ctggagcagg 120
 ccagccaggc aatgccattg gctagcgcac ttcccgact ggtcgtggaa gccagcaaga 180
 cggctgccgg ttatcaagcg cggttgcgcg acctgtcgat ccgcaacggc ctggacgtcg 240
 gccgggagcc agccttggca tccctgatcc aggacagcgc caaccagagc ggcctgggac 300
 gcacggtgac gctggacatg ctggagcact tgaacgccac cggcatgggg ttccgcccg 360
 cgcaaatgaa tctgggactg gcgggccgct tcggctttgg ccaagggatt gcttcagccg 420
 aggttgccgg gctggttcga gcgttgcaac tggcccaggg ttcggaactcg ccagagcaat 480
 tgtccgccac cctcgaccgc ctggctcgtc tgggtaaagg caga 524

<210> 476
 <211> 704
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 476
 aaggttgga ggatcaacga tcagaaaatg cgcgccatgg aggcgcgcgc ggaaaaggct 60
 ggcaaggcta tcggcaaaaag cctggacagt tcggcactga ttgccagcag cgtgctggac 120
 caggcgtgga acatgctggg caggaccagt cgcaggcgg gtcaggccaa gaagcctgtg 180
 cagagcggcc aggacaaggt actggccgag tggaagaccc ggcagaagga gctgggagaa 240
 gcctggaaga gctatcgga accactccag gatctgtcca agctcaacga agcactactg 300
 aagaactctt ccgacaagct cgacaaggcg ctgctcaatc tcagcgagac cggcaagctg 360
 tcgcttgcca acgtgggcaa ggccgcctac gccgatgctg cgcgcctcgc ctccgagcag 420
 atgaccctga tgctgctgga cgggctgttt ggctgggtcg ccagcgtcgg taccgagaag 480

cccaaggtcg acgacaaggc gggcaaggga caggcgaagg ctggcgacga cgagaaggaa 540
 cagccgtcgc tccagtcgca ggtcttcaag cagtggctgt tgcagatgaa cagtgtctgg 600
 ggcgcctacc gcgcgcccct gcaggatatc tccgggatga ccgacgagct gttcaggaat 660
 gcgtcggaga agctcgagaa gtcgtgttc aatttcgcca ctag 704

<210> 477
 <211> 234
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 477
 aggcattccat cgagctaccg gcaggcccg cgcagaccct gctgggtgccg ttgcggggcg 60
 ttctgccaga ggctctgggc atgcgtgcgg ggccgccgat gccacagatg gtcgaaggcc 120
 agcgggtgct gctggcgcca cgcgtggagg gctcgtgga ccgcgccagg gtcggagcgc 180
 tgagcctgtc cctgcgctcg ccgcaagctc cccagagtat cctgctcgga cggt 234

<210> 478
 <211> 349
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 478
 gcgaggagg attcgacagc ctcttgaga tgcgctggc gatcctgctg aacctggggc 60
 gcgcggaaca ggctctggcc ctgatcgcg agatggagga gaaggtcgag ggccgggagt 120
 ggaacaacat cagccagcca cggcgtctgt acaaggccca cggcctggcg ttgctggggc 180
 gcgacgagga ggccctggag gcgctgctgc cgttctccga gattgccccg cgctaccgta 240
 cgatctggct gcgcgccgct tacctgctgc tgcaacggac ccctgagcgc aacacctggg 300
 acttcggcgg gcgcctgcag cagatgctcg aacactactc gcagaaggg 349

<210> 479
 <211> 402
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 479
 aaggacttct ggtcgggtgct cgaaccgcag gacggccagg ccgcactgat ggccgggatg 60
 ctcgagcttg gccacagcca gccgttgag ccgaatgcga agatccccga aggcctggac 120
 atttcgatca accgcgcca ccagtgcgc acgccggcca gcacgatgc gttcatccgc 180

aagaacccag gttccggcat gcctttcgcg gtggccgggc tgagcgacga cgaatacgcc 240
 actttgcaga agtggctggc cgcgggcgcc ccggtcgacc agcagccgtt gcggccgacc 300
 gccgccgagg cgcgccaggt ggccagctgg gagcgtttcc tcaaccagcc tggggccaag 360
 cagagcctgg tctcgcgctg gctctacgag cacctgttcc tg 402

<210> 480
 <211> 514
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 480
 ttccctaacg aatgctgtca atcgccctgg tcaattgct ggtagtggac ccggcgcata 60
 cgttgccacc ttccgggtgc tgctcgctga ttccgaccag gctggtaaag acagtgacaa 120
 ggttcctgcc ggcgttcgca atgcattggc actggaggcg tccgctctgg ggcttcctgg 180
 cacggctgat ttgcaaagcg tcgccaaggc aggtggcacg gttgatatgc cggtagact 240
 cacgagtgtc gcacaagaga gcccagtggt taaatcgag attgccgcga tgttgaccaa 300
 cgggtgcaact gtccccaagg gcgtgcctgt tcgcgccgac accctcaatg ctgcgacggg 360
 ccggtatgag gtgacgggtc ccgcaaagtc caccgtgccg aatacaccac cgctgatctt 420
 gacctggacc cctgccaccc ctccaggaag ccagaacccc tcaagcacca ctccggtcgt 480
 accgcagccg gttccgggtg atgagggagc aacg 514

<210> 481
 <211> 604
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 481
 cgagcaccaa tatcgaactg gtttcgacca agggcgacct ggacctcgac ggctcgggtga 60
 actgggcatac gggcaaccgg ctggggctgg gctccgcggc cgacctgacg ctgaatggca 120
 ggctgaatgc cagtggcgcc aaggctgggc tggagctgaa ggccgaaggc gctatcgata 180
 tcaatgacaa gatcgttctc ggcggggctg gcagcgcgct ggccatggat gccggcgaag 240
 gccaccgggt gaacggcacg gcgtcggtct ccctggccgg ggccaacgcg acctacgtct 300
 ccggtggcta ttactacacg gtggtgcaga acctggcgca gttgcaggcg atcaacaaga 360
 acctggacgg cctgtacgtg ctcgccggca atatcctggg cggcagctat tactgcacgg 420
 cgctgcaatc catcgccggg cccgccggcg tcttcagcgg caccctggac ggtctcggca 480

acagcatcgg caatctctcg atcagcaaca ccgggccgaa tgcgggctg ttcgcccgt 540
cctcgggcac cctgagcaac ctgaagctga acaacctgcg ggtatccgat aacacctacg 600
gctc 604

<210> 482
<211> 412
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 482
gctttacctt gatcgaactg atgatcgtgg ttgcgatcat cggatttctt gctgccgtcg 60
ctttgccggc atatcaggat tacaccattc gtgctcgcgt gacagagggg gttggcctgg 120
ctgccagcgc caagacgctt attggcgata gctctgccac tgccggtgag ctaccgctt 180
cggcaagggt ctggaatgct caagccggta acgcccgtgc taccagtaag tatgtgacct 240
ctgtacaaat tgcagagggc actggtgaaa tctactgttac tttcaatgcc gcaaactggg 300
gtaatatcc ggctaactct accctgggat ttactcccta tgtgcagaat gctgccggtg 360
ccccgactca attgggtgcc agttatgctt ccggtgtgac tggctctatt ga 412

<210> 483
<211> 320
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 483
tgccgtgagt gaaatcagcg cggtgaagac cgctgcggag tcggcgattc tggaaggcaa 60
gaagcttggt tccaaggata atcccgcgga tggggaatat gatcttggtt ttaccaagtc 120
tactttgctt gctggcaacg acggtgaaggc acagatcacc atcactggcg aaagcagtgc 180
aaccgccacc attgcgggga ctctgggtaa ctctgctggt aaggccatca gcggtgccgt 240
tatcaccatc aagcgtagt ctgagggagt ctggacctgc gctaccagtg ggtctccggc 300
caactggaaa gccaaactacg 320

<210> 484
<211> 738
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 484
ggtatcaacc cactaaagggt ccgcaagaaa ggtatcacc tgtgggcagg gaagaagatt 60
aagcccatgg acatcgctt gtttcaactc gcagatgtct accatgatgg gtgccggcga 120

ccggtactgc aatcttttga catcatcggc gaaggattcg aaaatccaaa catgcgcaag 180
 ctagtcgatg agatcaagca ggatgttgcc gccggtaaca gcttagccag ttcacttcga 240
 aagaaacca tttacttcga tgatctctac tgcaacctgg tcgatgctgg cgaacagtcc 300
 ggtgcttttg agacattatt ggatcgggta gcaacttata aagaaaagac agaatccctg 360
 aaagccaaaa ttaaaaaagc catgacttat cccattgcag taattgtagt ggcccttgta 420
 gtatcggcga tccttctgat aaaagtggtc ccacagttcc agtccgtatt tgcaaatttt 480
 ggtgccgagt tgccggcctt tactcaaatg gtcacaaac tttccgagat gcttcaagag 540
 tgggtggctca tagtgcttat tgggtctttt gccgcagctt ttgcatttag ggaagctcat 600
 catttgggat cagtagatcg gggcctgctg aaactaccta tcatcggcgg gatactttac 660
 aaatcagcta tcgcccgcga cgcccgaacg ctatccacta cctttgcggc tggagtgccct 720
 ctggtagaag ctctggac 738

<210> 485
 <211> 740
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 485
 gaagtgaact ccgccaagga tctgaaggcg gcgctgggca tcatcgtgca gcgggtcaag 60
 gaagccatgg gtacccaggt ctgctcggtg tacctgctcg acaccgagac ccagcgtttc 120
 gtcctgatgg ccaccgaagg cctcaacaag cgttccatcg gcaaggtcag catggccccc 180
 agcgaaggcc tggtcggcct ggtcggcacc cgcgaggagc cgtcaacct ggagaacgcc 240
 gccgcccacc cgcgtaccg ctatttcgcc gagaccggcg aggagcgcta cgcgtcgttc 300
 ctcggcgcgc cgatcatcca ccataggcgg gtgatggggg tgctggtggt gcagcagaag 360
 gagcgccgcc agttcgacga aggcgaggag gccttcctcg tcaccatgag cgcccagetc 420
 gccggggtea tcgcgcatgc cgaggcgacc ggttcgatcc gcggcctggg caagctcggc 480
 aagggcatcc aggaagccaa gttcgtcggc gtgcccgcg ccccggggt cggggtgggc 540
 aaggcggtgg tgggtgtgcc tccggccgac ctggaagtgg tgccggacaa gcaggtcgac 600
 gacatcgacg ccgagatcgc cctgttcaag caggccctgg agggcgttcg cgccgacatg 660
 cgcgcgctgt cgagcaagct cgccagccag ttgcgcaagg aagaacgcgc gctgttcgac 720
 gtctacctga tgatgctoga 740

<210> 486
<211> 680
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 486
tcgagaagtc gatgttcaag gacctcggca ttcccactcc ggattttgcg gacgtccagt 60
cccaggccga cgttgatgcc gctgcagcag ccataggcgt gccggcggtg ctcaagaccc 120
gcacactggg gtacgacggc aagggccaga aggtcctgcg ccaaccggcc gacgtgcagg 180
gcgcgttttc cgaactgggc agcgtgccgt gcctcctcga gggcttcgtg ccgttcaccg 240
gggaagtttc gctgggtggcg gtgcgcgctc gagatgggga gacgcgttta taccctctgg 300
tgcacaacac ccacgacagc ggcatcctca agctctccgt ggccagcagc gcgcctccgt 360
tgcaggcgct ggccgaggac tacgtcggcc gtgtgctggc ccggctcgac tacgtcggcg 420
tgctggcctt cgagttcttc gaggtggacg gcggcctgaa ggccaacgag atcgccccgc 480
gcgtgcacaa ctccgggcac tggaccatcg aaggcgccga gtgcagccag ttcgagaacc 540
acctgcgcgc cgtcgcgggc ctgccgctgg gctcgaccgc caaggtcggc gagagcgcga 600
tgctcaattt catcggcgcg gtgcccccg tggtcaggt ggtcgcgcgc gccgactgcc 660
acctgcatca ctacggcaag 680

<210> 487
<211> 210
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 487
agacctacaa caaggtttcg cgcttcatcc gcgagatccc gccggcgcgtg atccaggaaag 60
tgcgccctgtc caataccgtc agccgcccct acggcggcac ctgcgcagc gccggcggca 120
acctcttcag cggcgccggg gtgccggaga cgcccttctc cctcggccag cgggtgcgcc 180
acgcgctggt cggcgaaggg actatcctca 210

<210> 488
<211> 351
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 488
attcctctct gaatcgctgg aagggtttc cgccgccatg atcgccgagc tgggacgcta 60
ccggcatcag gtcttcatcg agaagctggg ctgggacgtg gtctccacct ccagggtccg 120

cgaccaggag ttcgaccagt tcgaccatcc gcaaaccgcg tacatcgctg ccatgggccc 180
ccagggcatc tgcggttggt cccgcctgct gccgacgacc gacgcctacc tgctcaagga 240
agtcttcgcc tacctgtgca gcgaaacccc gccgagcgat ccgtcgggtc gggagctttc 300
gcgctacgcc gccagcgccg cgagcgatcc gcaactggcg atgaagatat t 351

<210> 489
<211> 530
<212> DNA
<213> Pseudomonas aeruginosa

<400> 489
aggaatgacg gaggcttttt gctgtggtgg cacggtttgc gttgcgagat gcagccgatc 60
cacgacagcc agggcgtggt cgccgtcctg gaaaaggaag tgcggcgccct gggcttcgat 120
tactacgcct atggcgtgcg ccacacgatt cccttcaccc ggccgaagac cgaggtccat 180
ggcacctatc ccaaggcctg gctggagcga taccagatgc agaactacgg ggccgtggat 240
ccggcgatcc tcaacggcct gcgctcctcg gaaatggtgg tctggagcga cagactgttc 300
gaccagagcc ggatgctctg gaacgaggct cgcgattggg gcctctgtgt cggcgcgacc 360
ttgccgatcc gcgcgccgaa caatttgctc agcgtgcttt ccgtggcgcg cgaccagcag 420
aacatctcca gcttcgagcg cgaggaaatc cgctgcggc tgcgttgcat gatcgagttg 480
ctgaccaga agtgaccga cctggagcat ccgatgctga tgtccaaccc 530

<210> 490
<211> 569
<212> DNA
<213> Pseudomonas aeruginosa

<400> 490
ttcaacctca acggaactgg gcgcaagcgc aaggtcaagc cggactcggg gaagcagttc 60
cgtcgccctgc tggccaccct ggggatgaag gaagagatcg tccagggctt gccggaccgg 120
ctggccgact ggctcgacgc cgaccagaat ccgcagggcg agcaaggcgc cgaggacaac 180
cagtacctgc tggaggcgcc ggcctaccgc gccgccaacc gcagtttcaa ggacgtgtcc 240
gagctgcgcc tgctgaaatt gtcggaagcc gactatcgac gcctgctgcc gttcgtcagc 300
gccttgcccg aagatgcgcc gctgaacgtg aacactgccg gcgtgccggg gctggccgcc 360
atgttcgaga tcgatccggg acaggcgga aacatcgtag acgcccgcgg tcgggaaggt 420
ttccagagca aggacgattt caccaagcat ctgaccagat tgggttcgaa gaccggaac 480

gtcagttatg ccgtcggcac ccgtacttc caggtgatca gcgaggtcag cctgggcgac 540
cgccggcagg tgctggtgag taccttgca 569

<210> 491
<211> 345
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 491
cattgaaagg tcgtagcgat gcgtataccc aggtagacaa cttcctgcat gcctatgcgc 60
ggggcgggga cgaattggtc aatggccatc cgtcctatac cgtcgaccag gcggcggagc 120
agatcctccg cgaacaggcg tcttggcaga aagcgccggg cgactcggtg ctgaccctgt 180
cctattcggt cctgacaaaa ccgaacgact tcttcaatac gccgtggaag tatgtcagcg 240
atatctactc gctgggcaag ttcagcgct tttccgcgca gcagcaggcc caggccaagt 300
tgtcgtcgca atcctgggtcg gacgtcacca atatccactt cgtcg 345

<210> 492
<211> 576
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 492
ggtcaagcac atcctagtgc gcgacggcca gcatgtggag gcgggcgagc cgctgatccg 60
catggaaccg acccaggccc gggccaacgt cgattcgctg ctcaaccggt acgccaacgc 120
gcgggtcaac caggcgcgcc tgcaggccga atacgacggc cggcggaccc tggagatgcc 180
cgcggggctg gccgagcagg ccccgtgcc gaccctcggc gagcgcttg agttgcagcg 240
gcagttgctg cacagccgcc agaccgcgct ggccaacgaa ctctccgcat tgcgggcgaa 300
catcgagggg ctgcgcgccc agctcgaagg gttgcgccag accgagggca accagcgct 360
gcaacaacgc ctgttgaaca gccagttgag cgggtgcgcg gacctcgccg aggaaggcta 420
catgccgcgc aaccagttgc tcgaacagga gcgccaactg gccgaggtga acgcccggct 480
atcggagagc agcggtcgct tcgggcagat ccgccagagc atcgccgagg cgcagatgcg 540
catcgcccaa cgcgaggagg agtaccgcaa ggaagt 576

<210> 493
<211> 581
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 493
 ccgaaggact tggtttactc caactttgtg cagcaggacg gcggtagcac cctggtggg 60
 cagtacgaca tgatcaacga aggcagccaa gtgattgaac ttgccgtcaa cttgcaacaa 120
 gggtttagtg acaccttcac ctggagcgtc actgagcagt tgaaggctcg tgtggaagtc 180
 aaggtgaagg cgaacattcc cctagtgggc ggcgctgaga tcaccagtac ggtggaattg 240
 tcaactgtcct ctacccaagg ggcgagtacc agcaagtctt ccaactatgg cgcctctacc 300
 aaggtgctta tttccccaca tagccacggc tggggagagg ttgccttgag ctttactgag 360
 ctgcgcactc agtgggtcgg taatgtcggg cttcaaggat atgtggcaat ttggttcaac 420
 aacaaagtcg cattgaacaa cgatggcgat taccactacc tgtggttcat tcccgaggag 480
 caggtatttt gggagtgcgt ccagcacaac atagtcaata cctcgggcta tgtcgtacaa 540
 ggcaatggag tgttggcgca agccacaggc accttcata g 581

<210> 494
 <211> 457
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 494
 cactttccgt tattgcctcg aagacgaagg ctacagcgtg gccaccgcca gcagcgcgcc 60
 gcaggcggag gccctgttgc agcgccagggt attcgacctg tgettcctcg acctgcgcct 120
 gggcgaagac aacgggctcg acgtttctgc ccagatgcgc gtccaggcgc catggatgcg 180
 cgtggtgata gtcaccgcgc attcggcggg ggataccgcg gtcgatgcca tgcaggccgg 240
 cgcggtggat tacctggtca agccctgcag cccggaccaa ctgcgcctgg ccgccgcaa 300
 gcaactggag gtgcgccaac tgaccgcgcg cctggaggcc ctggaggacg aagtgcgccg 360
 ccagggcgac ggcctggaat cgcacagccc ggccatggcc gcggtactgg agaccgcgcg 420
 ccaggtagcg gcgaccgacg ccaacatcct catcctc 457

<210> 495
 <211> 289
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 495
 gactggctga atcgtctcgc cgaggccgat cgccagaaca gtttccaagg caccttcgtc 60
 tacgagcgca atggcagctt ctccacccat gagatctggc atcgcgtgga gagcgatggt 120

gcggttcgcg agcgctgct ccagctcgac ggcgcgcgcc aggaagtggc ccgggtcgac 180
 gggcgacccc agtgcacag cggcggcctt gccgaccaac tggccgatgc ccagctgtgg 240
 ccggtgcgca agttcgatcc ctcccagctg gtttcctggc acgacctgc 289

<210> 496
 <211> 659
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 496
 attgtcgatg acgaacctct ggcgcgagag cgcctggccc gattggtagg gcaactggac 60
 ggctatcgcg tcctcgagcc ctcggccagc aatggcgaag aagcgtgac gctgatcgac 120
 agcctcaagc ccgatatcgt cctgctggat atccgatgc ccggtctgga cggcctccag 180
 gtcgcggcca gactctgcga gcgggaagcg ccgccggctg tgatcttctg cacggcccat 240
 gacgaattcg ccctggaagc cttccaggtc agcgcctggg gctacctggc caagccggcg 300
 cgcagcgaag acctggccga ggcgttgaag aaagcctcgc gaccgaaccg cgtgcaactg 360
 gccgcgctga ccaagccccc ggctccgggc ggcagcggtc cgcgcagcca catcagtgc 420
 cggacccgca aggggatcga gctgatcccg ctggaagagg tgatcttctt cattgccgac 480
 cacaagtacg tgaccttgcg ccatgcgcag ggcgaggtgc tgctggacga gccgttgaag 540
 gcgctggaag acgagttcgg cgagcgcttc gtgcgcatcc accgcaacgc gctggtcgcc 600
 cgcgaacgga tcgaacgcct gcagcgtagc ccgctggggc atttccagct ctacctgaa 659

<210> 497
 <211> 629
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 497
 cgtttgggac agattgaggc ccgccaggtc gccaccccca gtgaagcgca gcagttggcc 60
 cagcgccagg acgcgccgaa gggtaggggg ctgctcgctc gcctgggcgc ggcgctcgtg 120
 cgtccgttcg tggcgatcat ggactggctg ggcaaactgt tgggctccca cggccgcacc 180
 ggcccgcagc ccagtcagga cgcgcagcct gcggtcatgt cctcggccgt cgtgttcaag 240
 cagatgggtgc tgcagcaggc attgcccatt accttgaagg gactcgacaa ggcgagcgag 300
 ctggcgaccc tgacaccgga aggactggcc cgggagcact cccgcctggc cagcggagat 360
 ggggcgctgc gttcgctgag caccgccttg gccggcatte gtgccggcag ccaggtcgag 420

gagtcccgtg tccaggctgg ccgctgctc gaacggagca tcggcgggat cgcgctgcag 480
 cagtggggca ccaccggcgg tgccgcgagt caactggtgc tcgacgcaag cccggaactg 540
 cggcgcgaaa tcaccgacca gttgcatcag gtaatgagcg aggtcgcaact gttgcgccaa 600
 gcggttagaga gcgaggtcag cagagtatc 629

<210> 498
 <211> 332
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 498
 aatgcgataa ccatcagcgt cgccgaggcg gcggacagca gcgtcgatct cggcgccacc 60
 atgatcacct ccaaccagtt gggcaccatc accgaggaca gcggctccta tacgccaggc 120
 actatcgcca cggcgaccgg cctggtcctg actccgcgcg agacgcccc a gtcgatcacc 180
 gtggtcaccg gccagaacat ggacgacttc ggcctcaaca acatcgacga cgtcatgcgc 240
 catacgcccg gcataccggt ctccgcctac gacactgacc gcaacaacta ctatgcccgc 300
 ggcttctcga tcaacaactt ccagtacgac gg 332

<210> 499
 <211> 456
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 499
 ctgggacggt agtgtcatcg acgagatgga aatcgatggt tatgacgcac tcagtcctta 60
 ttacatggtg atccaggaag atactcctga agcccagggt ttcggttgct ggcaattct 120
 cgataccact ggcccctaca tgctgaagaa caccttcccg gagcttctgc acggcaagga 180
 agcgccttgc tcgccgcaca tctgggaact cagccgtttc gccatcaact ctggacagaa 240
 aggctcgtg ggcttttccg actgtacgct ggaggcgatg cgcgcgctgg cccgctacag 300
 cctgcagaac gacatccaga cgctggtgac ggtaaccacc gtaggcgtgg agaagatgat 360
 gatccgtgcc ggctggacg tatcgcgctt cggtcgcgac ctgaagatcg gcatacgagc 420
 cgcggtggcc ttgcgcatcg aactcaatgc caagac 456

<210> 500
 <211> 275
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 500
aagaagtctc tgctccccct cggcctggcc atcgggtctcg cctctctcgc tgccagccct 60
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ggcgagcagt tgctgcaaca ggtggaggaa atcgt 275

<210> 501
<211> 648
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 501
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tgcgcgcta catcgccgcc gaactccagg agccggcgcg cggccaggcg ttggcgctga 180
tgcagcaata catcgactac aagaaggaac tgggtgctgct cgaacgcgac ctgccgcgcc 240
tggccgacct cgacgccctg cgccagcggg aagccgcggt gaaagccctg cgcgcgcgga 300
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ccatcgaccg cctgcgcgcc agcctgccgg aagaccagca ggaaagcgtg ctgccgcaac 480
tgcaaagcga actgcagcag cagaccgccg ccctccaggc cgctggcgcc ggcccgaag 540
ccatccgcca gatgcgtcag caactggtgg gcgccgaagc caccaccgcg ctggagcaac 600
tcgatcggca acgctcggcc tggaagggcc ggctggacga ctatttcg 648

<210> 502
<211> 405
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 502
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cgcggtgcgca tggatatcac cagcaagccc gagttcgacg gctggcgctg ggtgagttac 360
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<210> 503
 <211> 542
 <212> DNA
 <213> *Pseudomonas aeruginosa*

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 cgtgccatcg cgtccttcgg caagggaag gccggcatcg cccatctgca ggcgagagtc 180
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 tt 542

<210> 504
 <211> 427
 <212> DNA
 <213> *Pseudomonas aeruginosa*

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 gcagcgcgtc agcctgacca ccgatcgcg cagctgagc ctgctcagcc cccatggccc 360
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 gttcgac 427

<210> 505
<211> 417
<212> DNA
<213> *Pseudomonas aeruginosa*

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cctcaggcgg ctgcgccgagt ggctcgagcg ctgcttcccc gactgggagt ggcacaacgt 240
gcggatcttc gagaccgagg atccgaacca cctctgggtc gagtgcgacg ggcgcggcaa 300
ggcgctggtc ccgggggtatc cgcagggtta ttgcgagaac cactacatcc attccttcga 360
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<210> 506
<211> 356
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 506
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cttttcgtcg aggacggctg tggcggttta tggaccaccg ataccggctc gcccatcgtc 180
attcgtggca aggacaagct ggccgagcac gcggtgtggt cgctgaaatg cttcccggat 240
tgggagtggg acaacatcaa ggtcttcgag accgacgac ccaaccactt ctgggtcgag 300
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<210> 507
<211> 671
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 507
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cgtcccgcag agcgacgcgc gcaaggagga cgcctactgg cagcagttct accggcccag 120
tcccaaatac tggctctacg agcccaagag cctgccccgc caggaaaagg gccagcgccc 180
taccctcgcg gtgccctacc agttgcacgc cacgctggcc ctcgacatcg ccgccggcaa 240
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cgacgacctg ctgcagcca acggccgcta cgccttcgag gtgcacggcc ccaacggctt 480
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gtgcaggcgt gacggtgacg ccgaaccggg cctatacccg ggaggcagcc gtcgctatga 660
actcgaaccg a 671

<210> 508
<211> 304
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 508
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gcgcgcaagc gcctgcacga cagcttccag ggcgaccca gcggcgacta ccacctggaa 120
gtgcacggtc cgaacggltt cctccgggtc ttctcgcgca acctgcggcg cgacctggcg 180
gacggcaagg cgccgtgcc ggaagtgcgg atcgactacg agccgtgtt cggcaacctg 240
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tate 304

<210> 509
<211> 302
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 509
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aacgcaagca ggccgccgaa ggtctgatcg aacagctcaa gcgcgaggtg gcggtcggcg 120
ccgatccgcg ccagaccttc gaggagatcc agcgtctgac gccctatgtg gaggccgatg 180
ccaggcgccg cgaggcgctc gacttcgaga tctggatggc gctcaaggac aacgcctccg 240
tccagcagca agcgccgacg cctggcgagg aagagcaact gcggaatac gcgcaagagt 300
cg 302

<210> 510
<211> 722
<212> DNA

<213> *Pseudomonas aeruginosa*

<400> 510

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ctggcgggat ggtcgctcgg cggcaacctg gcgatggatg tcgcggcccg gctggagcag      180
cgtgggcggc aggtggcttt cgtcggctgg atcgatgcac cggcaccggt cagggtcgaa      240
gcgttctgga acgagatcgg gccgacgcgg gaggcagtcc cgaacctatc cgtgggcgag      300
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atccagcggg gcgcggtgga gcgctcgatg gccgaggcga tcggggctga gcgtgtcgaa      660
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<210> 511

<211> 616

<212> DNA

<213> *Pseudomonas aeruginosa*

<400> 511

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aaggactacg gtttcgccta tcgtcccggg cagcaatggt tctatccggc agacctgcag      180
gtgcaaggca agaccctgaa cgacctcttg ctgagcgtgc cgtccaccta ccgtcggtac      240
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acgcgcgagg actcgcctta cgagcgtcgt ggcgcctatg cgaccctgga cgcgttgat      480
ggagcgcggg gcgagaaggt ggtggattgg gcgaccatgg aaaaggtcgc ggtcgagccg      540
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ttccatgatg tgctga

616

<210> 512
<211> 741
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 512
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gctgatgccg ctcttggtcc ggcaaagaat cttgcaccat tggacgtcat caaccgcagt 120
ctgaccatcg ttggaaacgc cctccagcaa aagaatcaaa aactactgct gaatcagaag 180
aagattacca gcctgggtgc aaagaatttc cttacccgta cggcgggaaga gatcggtgaa 240
caagcgggtgc gagaaggcaa tattaacggg cctgaagcct atatgcgctt cctcgacagg 300
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gcgatctccg atgcgattgc cgtcctgggc cgggtcctgg cttcagcacc ctcggtgatg 660
gccgtgggct ttgccagtct gacctactcc tcccggactg ccgagcaatg gcaggaccaa 720
acgcccgata gcgttcgtta c 741

<210> 513
<211> 211
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 513
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gttccctacc gaggagtctc atattcaagc cgtgcttgaa tttaaaaaac taacggaaca 120
cccaagcggc tcagaccttc ttactacco caacgaaaat agagaagata gccagctgg 180
agttgtaaag gaagttaaag aatggcgtgc t 211

<210> 514
<211> 589
<212> DNA
<213> *Pseudomonas aeruginosa*

<400> 514
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 agcgccgata tctataaggc gcaaatcgct atcttgaaac aaacgtctca agagctggag 180
 aataaagccc ggtcattgga agcagaagcc cagcgagccg ctgctgaggt ggaggcggac 240
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 aatgctttgc ctcaactgac caatccaacg ccagagcagt ggcttgaacg cgctactcaa 360
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 aaggaaatcg ctcgtaagc ggcgatcagg gctgccaata cttatgcca 589

<210> 515
 <211> 710
 <212> DNA
 <213> *Pseudomonas aeruginosa*

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 gccaaagcgt acagcgccga tatctataag gcgcaaatcg ctatcttgaa acaaacgtct 480
 caagagctgg agaataaagc ccggtcattg gaagcagaag cccagcgagc cgctgctgag 540
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 gaccaggctg ggaatgcttt gcctcaactg accaatccaa cgccagagca gtggcttgaa 660
 cgcgctactc aactggttac gcaggcgatc gccaaataaga agaaattgca 710

<210> 516
 <211> 752
 <212> DNA

<213> *Pseudomonas aeruginosa*

<400> 516

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cactggagaa acaaaaggca acctacaacg ccgatctcct agtggatgaa atcgccagcc	120
tgcaagcacg gctggacaag ctgaacgccg aaacggcaag gcgcaaggaa atcgctcgtc	180
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ccgatagcgt tcgttacgcc ctgggcatgg atgccgctaa attggggctt ccccaagcg	480
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cgaagccgt tccgggtccg atggcgccct acaatgccac gacaggcctg tacgaggtta	660
cggttccctc tacgaccgca gaagcgccgc cactgatcct gacctggacg ccggcgagtc	720
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<210> 517

<211> 739

<212> DNA

<213> *Pseudomonas aeruginosa*

<400> 517

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gaccatgggc acattgctgc gcgttggcgg ctgctcggcc atttctcagc agcgatatgg	180
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gctatcaaca ctctttggt 739

<210> 518
<211> 756
<212> DNA
<213> Pseudomonas aeruginosa

<400> 518
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<210> 519
<211> 473
<212> DNA
<213> Pseudomonas aeruginosa

<400> 519
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cccacgacca gttcgacaat gccgaacggc tggctccggct cggctgcggg atgcgcctgg 360
 gcgtgccatt gcgcgagcag gagttgcgcg gggcgtgtg gcgcttgctc gaggacccgg 420
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<210> 520
 <211> 459
 <212> DNA
 <213> *Pseudomonas aeruginosa*

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 tgcctgagcc atcgcgaacg cgagatcctg caatggacc 459

<210> 521
 <211> 519
 <212> DNA
 <213> *Pseudomonas aeruginosa*

<400> 521
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 tctttggcta tgacctctc acggtaatt atgttaatgt aatgaatgaa atctacggcc 420
 gccgcgaaga taaagatttc agtttcgaca actggctgaa gtcttattca gccgcacaaa 480
 agatccgctt gatcgaagcg aaaatcagcg tcctcaata 519

<210> 522

<211> 417
 <212> DNA
 <213> *Pseudomonas aeruginosa*

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 cagctcagcc acatgtcgcc gatctacacc atcgagatgg gcgacgagtt gctggcgaa 180
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 aagcgtgga gcgaatgggc cagcggcaag gtgttgtgcc tgctcgaccc gctggacggg 360
 gtctacaact acctcgcca gcagcgtgc aacctcgacg atacctggga aggcaag 417

<210> 523
 <211> 573
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 523
 actcttggtc tgatcttggg tgactctaag ctgatactg ggtcaggagt gaacattgaa 60
 aagtatcctg tgcaacagta tccaaatggt ggaaatggaa ttcaaggaga aacaatcggt 120
 tttaatttta ttggtaggat attaaaagaa aaaggatatag atacttatct ggctgctgcc 180
 caaattatta agagtcgata tcccaaaaca gagtttaata ttattggctt tatagaaccg 240
 acagagagta attatgaact taaaatttgt gacttagaaa aaaaaggaat cgtttattat 300
 ttgggacaac aaaaagatgc gatacctcat attaccggt cccatgcaat tatccatccc 360
 agtgtgtatg gtgaaggaat gagcaatgta ttactagaaa acgctagtgc aggacgtggt 420
 ttaattacga cagataatcc aggttgcaaa gaaattgtta aagatagaga gacaggctat 480
 atatttcaag ggggaaatgt tgaggaacta gtctctatat tggaagtttt ttaggtcta 540
 gaaaatgaaa aacgaaaaga gatgggactt caa 573

<210> 524
 <211> 535
 <212> DNA
 <213> *Streptococcus pneumoniae*

<400> 524
 aaatattggt gggttacttc gtgcaaatat ttgcttgata ttattaaaag tgtgtcgaaa 60
 caaggatcct acttttcatt attttttaaa atttggaaag aatgtaactg tcgaacagga 120

atctaagtct aaattaatct taggaaaaaa gattagagta aacgccgggg gagtattgaa 180
 agttagaaaa ggagcaaaac tcaagatttc tgatgatgta tttttgagta ataattgtat 240
 gatagcttgt cgtaaatata tagatattaa atctggagta aaatgtgggc ctggagtact 300
 tatatatgat catgactatg atgttagtgt tccaggtgga ttgaaagcaa aaaaatttaa 360
 gacggcccca gttatgattg gagaaaatgt ttggattgga gctaacagca ttgtcttgaa 420
 gggagtgagt attggtgaga atagtgtggt tgcagcagga agtgttgtaa caaaggatat 480
 tccagctgat actatattta ttcagaaacg tttatcaagg gagatgaaat tatga 535

<210> 525
 <211> 691
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 525
 ctaaagcatt tggagagatt gtactatgta gtcgttatga gaaggtggaa tcataccctg 60
 aaggatatca taaagcgaac tttattaata aatttatccc tatagaaggt ctacatcagg 120
 ttctatattg tcaaaataaa aataagatta ttgaaggaat gattgatagc gacttaatag 180
 ttgttcgtat tccgtctata attggatcaa aaactgcaga ctacgcattg aagataggta 240
 agccgtatct gacagaaaata atgggggatg cttgggattc ttactgggat catagtttaa 300
 agggaaaatt attagctcca tatatatacg caaaaactaa atcaattgta aaaaacgcta 360
 attattgcat atacgtgaca gaaaaatatt tacaagatag ataccctaatt attaaatcta 420
 atatcgttgc ttcaaatgtt aatattacct ctgtagagaa tagatctttg aagagccgtc 480
 tttataagtt gaaaaaattt aatcctcaaa aaatttcaat aatgacaaca gcatctgtga 540
 atgtacgagc caagggccat agatttgtat tggaagcaat gaagagatta gaaatacaag 600
 gtattttggt ggattattat ttagcagggt atggtgatca aagtttctta aaaaagaaag 660
 cagaggaatt gggagtagcg aatagaatcc a 691

<210> 526
 <211> 509
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 526
 tgtaggaact gatttggatg attctgagtt aacaaaaaga gcatggcagt ttgcagatct 60
 acttaaagggt ggagctatta aggaagagggt tccgatactg gttgttgctt ttaatgaagc 120

agagggttgca aaattgttta gtaacactta cttggcaact cgcgtacggt attttaatga 180
 gatagataca tatagcgagg taaaagggct taatcccaag acaattattg atattgtttg 240
 ttatgatcct agaattggat catactataa taaccctagc tttggttacg gagggatttg 300
 cttaccaaaa gacacaaagc aattgaaagc aagtttttagg gatgttcctg aaaatctgat 360
 tacagctgtg gtgcaatcta ataaaacaag aaaagattat atagctggag ctattctagc 420
 taaacaacct agtgtttagt gtatttatag attaattatg aaatctgatt ctgataattt 480
 tcgttctagt gctgttaagg gagttatgg 509

<210> 527
 <211> 695
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 527
 tttccagaca taaaccatcc gaaattattg tggttattaa cggcccaaaa aacgagagac 60
 ttgtaaaact ttgtcatgat tttaatgaaa aattagaaaa taatatgact ccaattcaat 120
 gttattacac tcctgttcct ggcaagagaa atgctatcct ctttgggctg gagcatgtgg 180
 attcgagag tgatattaca gttctagtag atagtatac agtatggacg cctagaacct 240
 tgagtgtgtt gctgaagcct tttgtttgag ataaaaaat aggtggggta acgacaagac 300
 aaaaaattct tgacctgag cgtaatctcg tgacaatgtt tgctaacttg ttagaggaaa 360
 ttagggcaga aggaactatg aaagcaatga gtgtgactgg taaagtaggg tgcttacctg 420
 gtcgaacaat tgcttttaga acagagatto tcagagagtg tatacatgag tttatgaatg 480
 agactttcat gggatttcat aaggaagttt ctgatgatag aagtcttaca aatttgactt 540
 taaaaaaagg ctataaaact gttatgcagg atacttctgt tgtgtataca gatgctccta 600
 caagttggaa aaagttcatt agacagcaac taaggtgggc agaaggttct cagtataaca 660
 atctaaagat gactccttgg atgattagaa atgcc 695

<210> 528
 <211> 542
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 528
 tcgtcatctg tactgggtctg ggcttgcttg taggaggatt tttcctgcta aaaccagctc 60
 cacaaacacc tgtcaaagag acgaatttgc aggctgaagt cgcagctgtt tccaaggatt 120

tggtatccga aaaggaagtg aacaaggaag aaaaggaaga accccttgaa caagatctaa	180
tcacagtaga tgtcaaaggt gctgtcaaat cgccagggat ttatgacttg cctgtaggta	240
gtcgaatcaa tgatgctgtt cagaaggctg gtggcttgac agagcaagca gacagcaagt	300
cgctcaatct agctcagaaa gttagtgatg aggctctggt ttacgttcct actaaggag	360
aagaagcagt tagccaacag actggtttgg ggacagcttc ttcaataagc aaggaaaaga	420
aggtcaatct caacaaggcc agtctggaag aactcaagca ggtcaaggga ctgggaggaa	480
aacgagctca ggacattatc gaccatcgtg aggcaaatgg caagttcaag tcagtagacg	540
ag	542

<210> 529
 <211> 545
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 529	
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tcaaaattgg caacagagtc aagcgagtca aaatctggcg gattctgttg aaagggtagc	120
gattctgcct gacactgtta aggtcaatgg tgatagtctg tcctttcgcg gcaaggctga	180
tggacgcatt tttcaagtct attataaact ccagtccgag gaggagaaag aagcctttca	240
agctttaacc gacctgcatg agataggact agaagggaag ctttcggagc cagaagggca	300
gagaaatttt ggtggcttta attaccaagc ctatctgaag actcagggaa tttaccagac	360
tctcaatata aaaaaaatcc agtcaactta aaagattggc agttgggata taggagaaaa	420
cttgtccagt ttacgtogaa aggctgtggt ttggattaag acgcactttc cagaccctat	480
gcgcaattac atgacaggac tcttgctggg acatctggac accgactttg aggagatgaa	540
tgagc	545

<210> 530
 <211> 402
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 530	
gattatcgga gaaattcgtg acagcgagac ggcgctgca gtggtcagag ctagtgtgac	60
aggtgcgaca gtcttttcaa ccattcacgc caagagtatc cgaggtgttt atgagcgtct	120
gctggagttg ggtgtgagtg aagaagaatt ggcagttggt ctgcaaggag tctgctacca	180

gagattaatc gggggaggag gaatcgttga ctttgcaagc agagattatc aagaacacca 240
agcagccaag tggaatgagc aaattgacca gcttcttaaa gatggacata tcacaagtct 300
tcaggctgag acggaaaaaa ttagctacag gctaagcaaa aaaatatcat caccctatct 360
aacaatctct tttctagcgg ttttcatctg gtggagacta tc 402

<210> 531
<211> 463
<212> DNA
<213> Streptococcus pneumoniae

<400> 531
tggacaagca gtgtgtgacc cagatgcgtg tgggcttgtc tcaggggaaa tcattctcag 60
aatgatgga aagtttgga tgttcaagtg ctattgtcac tcagttatcc ctagctgaag 120
ttcatggcaa tctccacctg agtttgggaa agatagaaga atatctggac aatctggcta 180
aggtaagaa aaaattgatt gaagtagcga cctatccctt gattttgctg ggttttcttc 240
tcttaattat gctggggcta cggaattacc tgctccaca actggatagt agcaatattg 300
ccacccaaat catcgtaat ctgccccaaa tttttctagg catggtaggg cttgtttccg 360
tgcttgccct tttagcactc actttttata aaagaagttc taagatgagt gtcttttcta 420
tcttagcacg ccttcccttt attggaatct ttgtgcagac cta 463

<210> 532
<211> 322
<212> DNA
<213> Streptococcus pneumoniae

<400> 532
aaaaatgatg acattcttga aaaaagctaa ggttaaagct tttacattgg tggagatggt 60
gggtgtcttg ctgattatca gcgtgctttt cttgctcttt gtacctaatac tgaccaagca 120
aaaagaagca gtcaatgaca aaggaaaagc agctgttggt aagggtgtgg aaagccaggc 180
agaactttat agcttagaaa agaataaga tgctagccta agaaagttac aagcagatgg 240
acgcatcacg gaagaacagg ctaaagctta taaagaatac catgataaaa atggaggagc 300
aaatcgtaaa gtcaatgatt aa 322

<210> 533
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 533
 atgctggaaa gtctcttggg tttgggactt gtgagtatcc ttgccttggg cttgtccggc 60
 tctgtccagt ccactttttc agcggtagag gaacagatth tctttatgga gtttgaagaa 120
 ctctatcggg aaacccaaaa acgcagtgtg gctagtcaac aaaagactag tttgaacttg 180
 gatgggcaga tgattagcaa tggcagtcaa aagttgacag ttcctaaagg aattcaggca 240
 ccatcaggcc aaagtattac atttgaccga gctgggggca attcgtccct ggctaagggt 300
 gaatttcaga ccagtaaagg agcgattcgc tatcaattat atctaggaaa tggaaaaatt 360
 aaacgcatta aggaaacaaa 380

<210> 534
 <211> 547
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 534
 ggctgtagga gacaatgaag ttcgtctctt gtctttgctt gagattgcca gtcaacgtag 60
 cagtctggtg attttgacag gcggtttggg ggcaactgag gacgacctaa ccaaacaac 120
 cctagctaaa tttttaggga aagcattagt ctttgatcct caggctcagg agaagttgga 180
 tatctttttt gccctgcgac cagactatgc ccgaacaccg aataacgaaa gacaagctca 240
 aattgtagaa ggagcgattc cactgccaaa cgaaacagga ctggctgttg gaggaaaatt 300
 agaagtagac ggagtgcct atgtcgtcct tccagggtccg ccaagtgaat tgaaacccat 360
 ggtcttaaac caacttctac ccaagttgat gacagggagc aagctgtatt cccgagttct 420
 tcgtttcttt gggattggcg agagccagtt ggttacgatt ttggctgatt taattgataa 480
 tcagatcgat cctaccttgg ccccttatgc caagacagga gaagtcactc tacgtctgtc 540
 aacaaag 547

<210> 535
 <211> 520
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 535
 ttgtagaga gacagaactt gaacgttctt cgatgggtat actatacctt ctccactttt 60
 ttgtattcta ttttagttcc tatggtaaca aattttttta aagagggtac ctagttgagt 120
 ttaatagtag tataagatat atttttttct ttgcaatagc tataagtgtg ttaaactttt 180

ttatagcggg acggttttagt atctctagaa gaggaatggg atacttctta actttagaag 240
 gaatatcctt atacttggtt aatttcttag taaagaaata ttggaagcat gtgtttttta 300
 atccaaaaaa tagcaagaaa attttactgt taacagtaac ggaaaatata gaaaaagttc 360
 ttgataaatt gctagaatct gatgaacttt catggaaact ggtagcagta agtgttttgg 420
 ataaatctga ttttcaacat gataaaatac ctgtaattga aaaggaaaaa attattgaat 480
 ttgcaacgca tgaagttgtg gatgaggtgt ttgtcgatct 520

<210> 536
 <211> 210
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 536
 aatatattat ccatgttatt atcctactaa tcgtaatcta aaaaatctta ttaaaaatac 60
 gattcttgct ttcaaaatth tgagaaagga acgccctgat attatcgtct catcaggggc 120
 agctgtagca gttcctttct tttatctagg gaaaatatth ggtgctaaga cagtctatat 180
 agaagtattt gatagaattg atgctccgac 210

<210> 537
 <211> 405
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 537
 tgagggatth attcaggatg atgtttttat tcaaacagga tactctaatt atgttccaaa 60
 attttgtaaa tgggaaaaat taatatctta tgaaaaaatg aatcaattga ttaaggaatc 120
 agatattatc attacccatg gcgggtccagc tacgtttatg gcagttattg ctaaaggtaa 180
 aaatccaata attgttccgc ggctaaaaaa atttggtgag catgtaaatg atcaccagat 240
 gcaatttgta aaaataacga aagaaatata caatttaata gttatagatg atatttcaga 300
 cttacattta attcttcata attttaagga caaacattth gaaacttatt tgaataacga 360
 gagatttaat gtacgtttca atgtggaaat cagtaacctt tttaa 405

<210> 538
 <211> 622
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 538
 tgctttaact cttttaccaa cctatataaa agaaaaacaa gtttttaaaa tagatacacc 60

gtctttttgt atggtgctat ggactattat atattctata tctataatat ttaattctct 120
gattgatgga ttggctgttc aagtgttatt ttcagatttg agtaaagcat ttaattggct 180
aatagcagta tttttttata attattattht gaaaatgccat atcaatattg acaggataaa 240
gagatatatg tattataaatt ttactatctt agttgttttt gtcggtttat tctatataca 300
aagaggctcc aatgtaattt tgtttggaag aagtttgta gactgggacg gatttacatt 360
agctactagt tatggtgtaa gatatacagg ttttttagaa tacgcaactt taaatggtca 420
gttaattctt tttttattac cgtaattag attgtttaga tttagatttt ttacacaaac 480
tatcattttt gcttttcttc tagaggtttt ggtactaagc aaatctagaa tagcgattgt 540
tgcaatgctt atatatatag catttgcagt agtcaatgag attaattcaa acaataaatg 600
gcttattgga attttctgtc ca 622

<210> 539
<211> 687
<212> DNA
<213> Streptococcus pneumoniae

<400> 539
aaggcaattc caatacaaaag cagatcgta ttattgataa tttttctaat aacggtacgg 60
gtgaaaaact acaagagctg tatgagtcag attcagagat tgatgtcttg attaaccatg 120
aaaatgctgg tttcgctcga ggtaataatg tagcatatca gtttgctaag gaaaagtaca 180
aacctgattt tatggttatc atgaataatg atattgagat agaaacagaa gagtttgaaa 240
aaatcgtgac agatatctat cggaaggaaa aattccattt gttaggacca gatattcttt 300
cgacgacgta tcagcttcac caaaacccaa aacggttgac gcattatact tatgaagagg 360
ttaaggctct caatgaaaaa ttaagaaaag ggagccaagt tagtctagca ttaaaaatta 420
aatgttggtt gaagtctagt aaagttcttc ggacagcaat ctatcaaaat aggcgtaaaa 480
agaaatcagt agactataga aaacaggtag aaaacccaat tcttcatggt tcgtttattg 540
tatattctag agatttaatt gagaaaagg agtatgcttt taatcccaat accttcttct 600
attatgaaac agagatatta gattatgaag ctgagttaa aggatataag agaatttata 660
caccgaagat taaggtcttg caccatc 687

<210> 540
<211> 534
<212> DNA

<213> Streptococcus pneumoniae

<400> 540

tttcaatgcc tctcttggct cttaatcgcc ctagtctaaa taccaagatt aaagtgcg	60
atcggctcat tgatatccaa ttctggaaaa tagctcttac tattatagtt gacctatta	120
ttctatatct ttataggaga gagattcata atcttgcaact tagccatggt tatacgggtt	180
caaattttca gtggttcttt agaaatgcta ccagttatga aggtgagcta acagtgcgaa	240
cttcgattog ggtcctcatt cgtatcattg acgtatctgc ttatatTTTT ggataactt	300
ttattaataa tttcttcatt tatagtcata aacgtcttaa agatttactg ctcttagttc	360
cattcttgat ttttatTTCT aaaaccttat tatctggggg tagattggat attataaaaa	420
ttttaattgc gtatgttgta atggcctata ttcagcaaaa acgaaaagtt ggctgggata	480
aggtcacttc ccataaatat atgagacttg gttttgtagg cttgatagct ggga	534

<210> 541

<211> 450

<212> DNA

<213> Streptococcus pneumoniae

<400> 541

tccattagtc aatgagttga aaaaacacga agatatggaa acaattgtgt gtgttactgg	60
acaacacaaa gagatgggta gtccgtgtttt agatttattt ggtgttgtag cagattatga	120
tttagaaatt atgaaggcta accaaacctt gttctctatc acaactagta tcttggaaaa	180
gataaaacca gttttagaga aggaacaacc agatattgtc ctagttcacg gtgacactac	240
gacaacttat gcagcagcct tggcagcatt ctatttggga attaaagtag gacatgttga	300
agctggtttg cgaacgtaca atttacaag tccatttcct gaagaattta acaggcaatc	360
gacatcaatc attgcaactt accattttgc tccaactgag ttggctaaag aaaatctctt	420
aaaagaaggt agagagaatg tttatgtgac	450

<210> 542

<211> 565

<212> DNA

<213> Streptococcus pneumoniae

<400> 542

gaagcatagc acaaacttcc aagtgttttc aaagatagaa ttatcgctgg gaaatatcag	60
gttcttactt atcaatactg tgatacgttg cattgctact ttctctgact attcctttta	120
gcagatgaaa gaaaacgttt gggcttgcca cgaaatacca atctaggatt gcatttgatt	180

gatatcattc ctttagatgg agcaccaaat cattcggttt taagaaagat ttacttttgt 240
aaagtatact ggtatcggtt ttttagcaagc ttaggaacaa cttatgttgg cgaccatgtg 300
gatatgcatt ccactaagca aaaactaatt attgggttct ttaaaaaact aggatttgca 360
aaactatttc ctcaaaattc tgtatacaga cgcttggata atctctatag aaagtatgat 420
tggaaaaagc agaagtatgc ggggactatc aatgcttctt tatttgctaa agaagttatg 480
ccagtagaga tttggggaga aggagtagag aagccttttg aggatacctt ctttaaagtt 540
ccaacggagt atgatcgcta cctga 565

<210> 543
<211> 662
<212> DNA
<213> Streptococcus pneumoniae

<400> 543
gtgatagtga acttgggatt gtctagtatt attcagtaca tttcttattt tatgttgatg 60
ttgtgtgtat ttttaacatt aattaagaat actctcaacg tgtttgcaaa tagaatcata 120
tattttttga ttatttcatt tttgtttatt attgggatta atttacaaaa tcttccatta 180
tcaagaaaga tttattttatc attctctatg ttaattattt ctagcttata caccttaccg 240
ataaagctaa taaataatct cagtgattta agaaggatat catattactt attgcacagc 300
atatttttat ctgtattttt aggtttgggt tttaaaatat ctttagtaac agttgtgtga 360
gagggaaattg gcttttcata tggttttaat ggaggtttga ctcataaaaa tttttatgca 420
attacaattt tagtttcccta tattctacta tatgtcagca gaaaatatga cgctaaacat 480
cagattgata gttttgtatt atgggttagat ctttttttac ttttaatatc taatacgcga 540
acagtttata taatactagt tgtttttttg attattatta atagaaattt tataaataat 600
attaaaaaag agcatagact ggtagtgaac gcaacgacaa tagtcatctc ttactggcg 660
tt 662

<210> 544
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 544
agagcaaaaa cgctgggttc tcaacaggtc aaccttggtt ggcggttaat ccaaattacg 60
agatgatcaa cgtacaagaa gcgctggcaa atccagattc tattttctat acctatcaga 120

aactggtcca aattcgcaag gagaatagct ggctaattcg agctgacttt gaattgcttg	180
atacggctga taaggctctt gcttatatac gtaaggatgg cgaccgtcgc ttcctagtgtg	240
tggctaactt gtccaatgaa gagcaagact tgacagtaga aggaaaagtc aaatctgtct	300
tgattgaaaa caccctagct caagaagtct ttgaaaaaca aatcttagtt ccatgggatg	360
ctttctgtgt ggaattacta	380

<210> 545
 <211> 610
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 545	
acgaacagtg gacctgatac atgggccgat tcttcctcg ctcttaagct tcacctttcc	60
aatcttgcta tcaaatatct ttcaacagct ctataacact gctgatgtct tgattgttg	120
acgatttctt ggtcaagaat ccttggtcgc agtaggagcg acgacagcga tttttgacct	180
gattgtaggc ttacacttg gtgttgcaa tggcatgggg attgtcattg ctcggtatta	240
tggggctcgg aatttacta aaatcaagga agcagtagca gccacctgga ttttaggtgc	300
tcttttgagc attctagtta tgttgctggg ctttcttggc ttgtatcctc tcttgcaata	360
cttagatact cctgcagaaa ttcttcctca atcttatcaa tatatttcta tgattgtgac	420
ctgtgtaggc gtcagctttg cttataatct ttttgaggc ttgttgcggt ctattggtga	480
cagtctagca gccctgggat ttctgatttt ctctgccttg gttaatgtgg ttctggatct	540
ctattttatt acgcaattgc atctgggagt tcaatccgca ggacttgcta ccattatttc	600
gcaagggtta	610

<210> 546
 <211> 546
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 546	
ttgtcttgac tgggtgtgtc aatgtcgata aaaccacagg tcagccaaca ggatttattt	60
ggaataccat cggagccct atggctgaag ctatcaagta cttcgtact gataaaggtc	120
taggctttgg tgctgctatc atcatcgtaa ccattatcgt gcgcttgatt atcttgccac	180
ttggtatcta ccaatcatgg aaggcaacgc ttactctga aaagatgaac gccctcaagc	240
acgtccttga gccacaccaa acgcgtctca aagaagcgac tactcaagaa gaaaaactcg	300

aagcccaaca agctctcttt gctgctcaaa aagagcacgg tatcagcatg tttggcggtg 360
 taggatgttt ccctatcctc cttcaaagtc ctttcttctc tgctatctac tttgctgccc 420
 aacatactga aggggttgct caagcaagct acctaggcat tcctctaggt tctccaagta 480
 tgattttggt tgcctgtgct ggtgtccttt actatcttca atcgctcctt tcacttcacg 540
 gagtag 546

<210> 547
 <211> 262
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 547
 tgcaaaaggt tagaatgatt gcccaaggta gggtagagg agtcggcttt cgttggggtg 60
 tttacagctt ggcacttgaa attggtggca tcacaggctg agtatggaat aacgacgatg 120
 gcacagtgga aatcttagcc caagcagact catctgctat catggcaaaa tttatccaag 180
 aaatccgaaa aggaccgaca cttttttcaa aagtaagcta cttagatgtc aaactaagca 240
 actttcctcc ctactctgac tt 262

<210> 548
 <211> 629
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 548
 gttcggtaat ccagttgaag tcccttttga acattgggaa ctagaacatt gaattccaat 60
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 gcgtagtaaa gggttacacg gtaacggaca cgcttgtttt ggtccaaggc tttacgcacc 180
 ttgctttcat agtagttttg accagtcgaa tactcggctt gtgcctgatt tgcccaggct 240
 gtctgaacag caatgttttt aggattgctt gttgaggcat caaaaccatc caaaccaccg 300
 attaaggcat agcctaacaa atgacctcta tcgactgcat gggataaga gccctttaga 360
 ttcttgacct gatgccaaac tggaggagtc caagaagttg aaccattccc agttttctta 420
 cgattcttgt actgacgagt ggccttagac aagaggcat tagctacggg tggaacagtt 480
 tccttgccca ctgtctttgt tttattgtca gcgtagggct tacttgaaac cttggcatct 540
 agatttggtt tattaccatt gacgataaaa gcacctgagc cattccactc cagactcccc 600
 tttatttgac tcttgactgc gtctgttaa 629

<210> 549
<211> 323
<212> DNA
<213> Streptococcus pneumoniae

<400> 549
cgtggaaatt ttagaagaac tcttcccagg ctacgaaaac acgtggcgtt cttcccaaga 60
gcctgcccgt aaaggctatg ctggaacat gttcctttat aagaaagaac ttacacctac 120
tatcagcttc ccagaaatcg gtgccccttc taccatggac ttggaaggtc gtatcatcac 180
tctagaatit gatgcattit tctgaaccca agtttacct ccaaacgctg gtgacggtct 240
caaacgcttg gaagaacgcc aagtctggga tgccaaatat gctgagtatt tggctgaact 300
agacaaagaa aaaccagtcc ttg 323

<210> 550
<211> 206
<212> DNA
<213> Streptococcus pneumoniae

<400> 550
aaaatttggg ggattcagtt agctgcaatt aaaaaattg gtgttttgag ggaagaacgt 60
ataagcccca atcagctttg gcatgcactg gaaacagatt atgccggaga agaaggtaag 120
gtcattcaag aaatgttgat tcatgatgca cctaagtatg gtaatgatga tgattatgct 180
gacaaattgg ttactgctgc ttatga 206

<210> 551
<211> 510
<212> DNA
<213> Streptococcus pneumoniae

<400> 551
cctctaaggc tatgatggaa aagattgctg ttgctaagtc aaggacggta gaagaagatc 60
agacaaaagt ctgtgtaact cgctacggca atgttctatg tagtcgtggg tctgtgattc 120
ccctatggat tgatcaaata aagcaaggga atcctataac gattacggaa cctagtatga 180
ctcgttttat tatgtcctta gaagaagcgg tagacctagt tctgtttgct ttgaaaaag 240
gaaaaacagg agatatccta gtacagaaag caccagcatg taccattgaa gtgttggcgc 300
aagctgttac ggaacttttt gcacctaatc aagatattaa agtaatcggg attcgccacg 360
gtgaaaagat gtatgaaacg ttgttgacta ctgaagaatg tacgaatgcc attgatttag 420

gcgcgttttta tcgtgtgcct agcgataatc gagatcttaa ctatgataag tatttcaacg 480
aaggggatgc caaacgcaat cccttaatag 510

<210> 552
<211> 589
<212> DNA
<213> Streptococcus pneumoniae

<400> 552
tgaagatgg acgagatagg actcgtccta atttagagat tggagagatt tttcagtatg 60
atcgtgatac agatccgatt ttattagatg aatattgtaa gaaggccgat ttcgtattcc 120
atttagctgg tgtcaatcgt ccacagaatc ctgatgaatt catggaggga aattacggtt 180
tttcaagtag attattggag attttagaaa agtatgaaaa cacttgtcct gttctactct 240
caagttctac tcaagctagt ttagaaggcc gattttcaaa ctctatatat ggacaatcta 300
agctagtagg ggaagaactc ttctttgaat atggaagaa aacgggagca cctgtccttag 360
tttaccgttt cccgaatctt tatgggaagt ggtgccgtcc taactacaat tctgctgtag 420
caactttctg tcataatcta gctcacgatt tacctattca agtaaatgat ccaagtgtag 480
aattggagtt gctgtatatt gatgatattga tacaagagtg tctaactgca ttggaaggaa 540
atcctcatcg ttgtaatcta gatggattac aaatcttacc tagcccatc 589

<210> 553
<211> 545
<212> DNA
<213> Streptococcus pneumoniae

<400> 553
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tgtttatcag ctattactgc caagcgttta catattccaa tttttcatat ggaggctggc 180
aatcgcgtga aggatgagtg cctgccggaa gagactaatc gtcggattgt tgatattatt 240
tcagatgtta acttagcata ctctgaacat gcacgtaagt atttacctga gtgtgggtta 300
cctaaagagc gcacatatgt aacagggtct cctatggcag aagtgttaca taaaaattta 360
tctgccattg agtcttcaga tatccatgaa cgtttgggat tgaaaaaagg aggttatatc 420
ttactttcag ctacacgtga ggaaaaatatt gatacagata aaaattttat ttctctcttt 480
acagcaatta atcaatttagc tgaaaagtat aatatgcca tcttatattc ttgccatcct 540

agatc 545

<210> 554
<211> 250
<212> DNA
<213> Streptococcus pneumoniae

<400> 554
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agctaggatga ttatttgatt gtagttgttt caagtgatga gtttaattta aaagaaaaga 120
ataaagtatg ttactttaac tacgaacaca gaaaaaattt agtagaagct attcgatatg 180
tcgatttagt aatccctgaa actagttggg aacagaaaaa gtcagatggt aaagactacc 240
atattgacac 250

<210> 555
<211> 283
<212> DNA
<213> Streptococcus pneumoniae

<400> 555
ctcctagtgc cctatatctt tgaatttcct gcggatgatg ccctgcgtct caaggaaaga 60
atgcctctct tagaggaagt gggcgtcttt ctagcagagt acggagaaaa tcaatttatt 120
ctacgtgaac atcctatttg gatggcagaa gaagagattg aatcaggcat ctatgagatg 180
tgcgacatgc tccttttgac caaggaagtt tctatcaaga aataccgagc agagctggct 240
atcatgatgt cttgcaagcg atctatcaag gccaatcatc gta 283

<210> 556
<211> 284
<212> DNA
<213> Streptococcus pneumoniae

<400> 556
cttgggtgcac agagtcctca aaaatcaatt tcagaacaaa cagcttatga aattgatgaa 60
gaggttcggt cattattaaa tgaggcacga aataaagctg ctgaaattat tcagtcaaatt 120
cgtgaaactc acaagttaat tgcagaagca ttattgaaat acgaaacatt ggatagtaca 180
caaattaaag ctctttacga aacaggaaaag atgcctgaag cagtagaaga ggaatctcat 240
gcactatcct atgatgaagt aaagtcaaaa atgaatgacg aaaa 284

<210> 557
<211> 627

<212> DNA

<213> Streptococcus pneumoniae

<400> 557

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aagtaggcga tggttatgtc tttagaggaga atggagtttc tcgttatatc ccagccaagg      60
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ctcataagct aggaactaag aaaactgacc tcccatctag tgatcgagaa ttttacaata      180
aggcttatga cttactagca agaattcacc aagatttact tgataataaa ggtcgacaag      240
ttgattttga ggctttggat aacctgttg aacgactcaa ggatgtctca agtgataaag      300
tcaagttagt ggaagatatt cttgccttct tagctccgat tcgtcatcca gaacgtttag      360
gaaaaccaa tgcgcaaatt acctacactg atgatgagat tcaagtagcc aagttggcag      420
gcaagtacac agcagaagac ggttatatct ttgatcctcg tgatataacc agtgatgagg      480
gggatgccta tgtaactcca catatgaccc atagccactg gattaaaaaa gatagtttgt      540
ctgaagctga gagagcggca gccagggctt atgctaaaga gaaaggtttg acccctcctt      600
cgacagacca tcaggattca ggaaata                                           627

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<210> 558

<211> 784

<212> DNA

<213> Streptococcus pneumoniae

<400> 558

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gcatctctcg ttatgtcttt gcgaaagatt taccatctga aactgttaaa aatcttgaaa      60
gcaagttatc aaaacaagag agtgtttcac acactttaac tgctaaaaaa gaaaatgttg      120
ctcctcgtga ccaagaatth tatgataaag catataatct gttaactgag gctcataaag      180
ccttgtttga aaataagggt cgtaattctg atttccaagc cttagacaaa ttattagaac      240
gcttgaatga tgaatcgact aataaagaaa aattggtaga tgatttattg gcattcctag      300
caccaattac ccatccagag cgacttggca aaccaaattc tcaaattgag tatactgaag      360
acgaagtctg tattgtcaa ttagctgata agtatacaac gtcagatggt tacatttttg      420
atgaacatga tataatcagt gatgaaggag atgcatatgt aacgcctcat atgggccata      480
gtcactggat tggaaaagat agcctttctg ataaggaaaa agttgcagct caagcctata      540
ctaaagaaaa aggtatccta cctccatctc cagacgcaga tgttaaagca aatccaactg      600
gagatagtgc agcagctatt tacaatcgtg tgaaagggga aaaacgaatt ccactcgttc      660
gacttccata tatggttgag catacagttg aggttaaaaa cggtaatthg attattcctc      720

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ataaggatca ttaccataat attaaatttg cttggtttga tgatcacaca tacaaagctc 780
 caaa 784

<210> 559
 <211> 502
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 559
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 gtgtctagtc taggcagtct ttcaagcaat ctttcttctt taacgacaag taaggagctc 180
 tcttcagcat ctgatggtta tatttttaat ccaaaagata tcgttgaaga aacggctaca 240
 gcttatattg taagacatgg tgatcatttc cattacattc caaatcaaa tcaaattggg 300
 caaccgactc ttccaaacaa tagtctagca acaccttctc catctcttcc aatcaatcca 360
 ggaacttcac atgagaaaca tgaagaagat ggatacggat ttgatgctaa tcgtattatc 420
 gctgaagatg aatcaggttt tgtcatgagt cacggagacc acaatcatta tttcttcaag 480
 aaggacttga cagaagagca aa 502

<210> 560
 <211> 462
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 560
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 acttcaaaag ctctctaacg cctgatgaac tgatatagag atgttcaggc cgactatgta 120
 aataaatagt ctctatatca gaagacagct gatgattgta gtaatcaaaa ctggcttcat 180
 attgcaaate cgacgcattc ctcaaaccac gcactagaca agtagcacc aatctttttg 240
 caacatcgac caccaattca tcatgagaag ccacgacttc aacattttcc agatgtccca 300
 aagccttttc tagccccgt ttacgatattt cgataggaag aaatccttgt ttgtggggat 360
 taataaaaaat acccacataa agcttatcaa aaagtctgct cgcccggtca atgatatcca 420
 gatgccatt tgtcatcgga tcaaatgagc ctgtgaataa gc 462

<210> 561
 <211> 508

<212> DNA

<213> Streptococcus pneumoniae

<400> 561

gatttctgta tgaggcagtt cgcgattgac tgcaaattta tcattgtttt cacagagtga	60
accaaccaca tctaccgctt cagctggtcc atctggatgg gtcacgttgc taatatgatg	120
gtaagctccg tacatagctg gacgcatgag gttgactgct gaggcacca cacctagata	180
ggtacggtag gtttccttct tatgagtga ctttgtgact agagcaccgt gaggtgccag	240
cataaaacga cccaattcgg tgaaaatctt gacctgacca agacctgctg acgtaagaac	300
ttcttcatac accttacgaa ctccctcacc aatcaaggcg atatcgttcg gtccttggtc	360
tggaagataa ttaacaccaa taccgccaga aagattgata aagtctagcc aaatgcccaa	420
cttttccttg atttcaacag ccagttcaaa gagctgacga gccaaactctg gataatagag	480
atgggtcacg gtattggacg ctaggaag	508

<210> 562

<211> 652

<212> DNA

<213> Streptococcus pneumoniae

<400> 562

ggctgttagt ccaagtcaag aactatattg aaagatcaaa gtaaaggaag ttcgttattt	60
gaaggaattt agaaatttaa attctaagga tgcaaggga tatgacttgg ctttattaat	120
tctagaaaag cccattggtg caaaattagg gactttgggt cttcctacta gtcaaaaaaa	180
tttgacagga ataactgtga ctatcacagg ctatccatca tataatttta aaattcatca	240
aatgtatata gataaaaaac aagttttaag tgatgatggc atgttcttgg attaccaagt	300
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agtgcatact ttaggagatg gagctaata aattaacagt gcagttaaata taaatgaagc	420
aaattgccat ttacttattt attcggttct taaaggttac tctcttgaag gatggaagaa	480
aataaatggg agttggtact attatagaca acatgataaa caaacgggtt ggcaggagat	540
aatgatact tgggtattat tagacagttc cggtaagatg cttacagatt ggcaaaaagt	600
aatggaaac tgggtattat tcaattcaaa tggagcaatg gttacagga gc	652

<210> 563

<211> 250

<212> DNA

<213> Streptococcus pneumoniae

<400> 563
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gagtttgtca aactttctcaa ggtaacgcgg tttattacgg aaaggaagag cacaggtgtc 120
caaggtacag tggattcctt gttccttagc cttggtgaag agagcaatca ggaaatcaat 180
ctgcaagaga gcttctcctc cactgactgt aatcccaccc ttatttcccc agaaaccacg 240
gtagcgcaag 250

<210> 564
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 564
ttgatatcca acaactacaa aaagacgaag taaacaatat tacatatattt gctgaaaatg 60
ctgctggcga agactgggat ttatcagata atgtcggttg gggccagac tttgccgatc 120
catcaaccta cttgatatac atcaaaccat ctgtaggaga aagtactaaa acatatttag 180
ggtttgactc aggggaagat aatgtagctg ctaaaaaagt aggtctatat gactacgaaa 240
aattggttac tgaggctggt gatgaggcta cagatgttgc taaacgctat gataaatcag 300
ctgcagccca agcttggttg acagatagtg ctttgattat tccaactaca tctcgtacag 360
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aaggtacaag tgaaccaatc ttatataaat acttggaact tcaagacaag gcagtcactg 480
tagatgaata ccaaaaagct 500

<210> 565
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 565
aggaaaacaga aaataaagag aaacataaag atattcataa tgctatagaa acttcaaagg 60
atactgaaga aaagaaaaca acaattattg aggaaaaaga agttgttagt aaaaatcctg 120
taatagacac taaaactagc aatgaagaag caaaaaacaa agaagaaaat tccaatcaat 180
ccaagggaga tcatacggac tcatttgtga ataaaaacac agaaaatccc aaaaaagaag 240
ataaagttgt ctatatgtct gaatttaaag ataaagaatc tggagaaaaa gcaatcaagg 300
gactatcaaa tcttaagaat acaaaaagttt tatatactta tgatagaatt tttaacggta 360

gtgccataga aacaactccg gataacttgg acaaaattaa acaaatagaa ggtatttcat 420
 cgattgaaag ggcacaaaaa gtccaacca tgatgaatca tgccagaaag gaaattggag 480
 ttgaggaagc tattgattac ctaaagtcta tcaatgctcc gtttg 525

<210> 566
 <211> 250
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 566
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 aagccgagga tcaaaaagaa gaagatcgtc gtaactaccc aaccaatact tacaaaacgc 120
 ttgaacttga aattgctgag ttcgatgtga aagttaaaga agcggagctt gaactagtaa 180
 aagaggaagc taaagaatct cgaaacgagg gcacaattaa gcaagcaaaa gagaaagttg 240
 agagtaaaaa 250

<210> 567
 <211> 280
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 567
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 agaagctaaa cgaaaagcag aagcagaaga agttaagat aaactaaaga ggcggacaaa 180
 acgagcagtt cctggagagc cagcaacacc tgataaaaaa gaaaatgatg cgaagtcttc 240
 agattctagc gtaggtgaag aaactcttcc aagcccatcc 280

<210> 568
 <211> 414
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 568
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 aagagtgact tgtagtcaaa ctgcttttca cgttcttctt gggcattgtc cgcaaagacc 120
 gctacacctg ccagttctga gtcgaactcg cgcaagagac taatcatacc gttgaccggt 180
 ccgccacctt tcaagaagtc atccacaatc aagacacggc tgcctgcctt aagactacgt 240
 tttgaaagga acattttctc gatacgggtc ccacttgaac ctgaaacata gttgacgcta 300

acagttgaac cttcggtaat ttccaggtca cggcgacaaa tgacaaaaga gacattgagg 360
acattggcaa ctgcatttgc aagtggcaca cccttagttg ctacgggtcat aacc 414

<210> 569
<211> 312
<212> DNA
<213> Streptococcus pneumoniae

<400> 569
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actaagacag cgaccttgga cttccgtcag gggaatcctg agccacgcta ccaagatgtt 120
ccacttggtt ccatcaactc tatgggcttg ccaataatg gcttagacta ttatttggat 180
tatcttttgg atttgcagga aaaagagtcg aaccgaactt tcttcttata tctggtcggc 240
atgtctccag aggaaaccca tactatttgg aaaaaagtcc aagagagtga ttttcgtggt 300
ctgactgagc ta 312

<210> 570
<211> 599
<212> DNA
<213> Streptococcus pneumoniae

<400> 570
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tcaaggaaga aggcttgagc attacagctg tgacgacttc tagtgtgacc agtaaacagg 120
ctgaagggtt caatatcccg ctcaagtcta ttgaccaagt agactttgtc gatgtgacag 180
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acggccaacg ttttgtgacc gatatgcaga attttatcat tgacctcgcc ttggatgtca 480
ttgaaaatcc aattgctttt ggacaagaat tggaccatgt cgttggtgtt gtggagcatg 540
gtttattcaa ccaaatggtg gataaggtaa tcgttgctgg acgagatgga gttcagatt 599

<210> 571
<211> 450
<212> DNA
<213> Streptococcus pneumoniae

<400> 571
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 atggcggagc ttcgtaaga attgacaaac ttgggactgg aaaaggttga gagctacatc 120
 aatagtggca atattttctt tacttcgata gattccaaag cccaattggg tgaaaagcta 180
 gagactttct ttgcagtcca ttatccatth attcagagct tttctttact gagtctagag 240
 gactttgagg cggaacttga aaatctacca gcttggttga gcagagactt ggcacgaaaa 300
 gattttctct tttaactga gggtttgat gtggaccaag tcacgcgcac agttgaaagt 360
 ttagagctga aagatgaagt gctttattht ggaaaacttg ggattttctg ggggaaatth 420
 tctgaagaat cctattctaa gactgcctat 450

<210> 572
 <211> 527
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 572
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 agtggaaaaa ttaagcatta tgtggttgat aatgacaatg ttgtgactcc cttgattcat 180
 aataatcgtg atattgttac atttacaggt aattcacgct ttaaacaccg ttctcgtggc 240
 tattttgaaa gtccaatgaa tgatattcct aactttaata ttggtaaaca agctaccttg 300
 gataaacatg gttatcgtga tccgaaattg gataaagtgc gattctthta gaaacaggct 360
 ctgcctcgat cttctagtca accaagcgct gaaccaatgg aaaatattgc ctcaggaaaa 420
 caggttactc aaagttcgac agctttcgga ggagatgcta gaagagctgt ggatggcaaa 480
 gtcgatggta actatggtca caattctgtc actcatacaa acttcca 527

<210> 573
 <211> 561
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 573
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 tttatgtgaa tattcttggc aaagtttttg gtaattttct ttttgagttt tgctacgcc 120
 atcccaaaga atccatctga taaactccca ctcaaagcgt tcagggcaat ctaccgccat 180

actttctctg acttttccac ggtatttaag ataacgctta aaggctctaa agagacaggt 240
 caatggcgaa aaattgagaa agatgatttg gtcagcttct tgcattcggt cttggtagta 300
 gcaccaagaa taattacat cgatgacca agctttatgc ttggtgagaa agttttttat 360
 ctcggttaac atccattcgc agtcactgtc ttgccaacca ggttgaaatt ggagtgtgtc 420
 catgtgcagt tttggaatgg agtagtagtt agataacttt tctgctatag ttgacttacc 480
 agaaccagaa tatccgataa ttgcgatttt cattttctac cttttcctat ttggagacaa 540
 aaaaacagcc tctatggact g 561

<210> 574
 <211> 503
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 574
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 caatcgcat ctgagtaaaa cgataatagt agctatcagg gtcgttttgg gctagactca 120
 gcattttcaa gaaacgggtcc agataccaac tttcaatatc atccactcca gcatctacat 180
 agatggaaaa gtcaaagaag tcagtgatat agagacgatc gttttgtgga ttttgaaaga 240
 cattgattcc ctcaacaatt acaaaatcag cagctttgac actttgtttc tcttcgggta 300
 cgatgtcgta aacttcatga gaatagacag gaatatctac atcttgtcca tttttgatgc 360
 ggtccaagaa gttgagaaga gcttccatat catagctttc aggaaatcct ttacgattta 420
 aaatcccctg ctcaatcaag gtttgattgg gatagagaaa accatcagtt gtaaccaact 480
 caaccgtagc atctgtaaac gta 503

<210> 575
 <211> 501
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 575
 aatagcagta gcagggacag gttatgtggg tttatctatt gcaattctat tagcgcaata 60
 tcataagggt atagcggtag atgttattcc tgaaaaagta gagcttatca atcgtcgcca 120
 atctcccatt aaggatgatg atattgaaac ttatttagtg gaaaaggaat tagacttagt 180
 tgcaacatta gatggtaatg aagcttatcg agatgtgac tttgtcataa ttgtgtccc 240
 aactaactat gacagtaaaa aaaattatct tgatacatct gttgtggaag cagttattga 300

gcagattatt gcggttaatt tgaaggcaac aattgtcata aaatccacaa ttcctgtggg 360
atatacagaa agtctccgaa cacgttttgg gcaatttaag attctcttta gtcctgaatt 420
tttacgggag tctaaagcac tttatgataa tctctatcct agtcgaatca tcgttgagac 480
agatttgaga gatacggagc a 501

<210> 576
<211> 200
<212> DNA
<213> Streptococcus pneumoniae

<400> 576
atgaatttaa catttttagg cttatgtatt gcctgtatgg gcgtatctgt cgggtgaaggt 60
ttattgatga atggactgtt taaatcagta gcacgccaac cagatatgct ttctgagttt 120
cgtagtttga tgtttttagg tgttaccttt attgaaggaa ctttctttgt aactcttgtc 180
ttctcattta ttatcaaata 200

<210> 577
<211> 300
<212> DNA
<213> Streptococcus pneumoniae

<400> 577
atgagtgaat taggctttaa atacagtatt ttagcgtcgg gttccagtgg aaattctttt 60
tatctggaaa cctcaaaaaa gaagctttta gtagatgcag gcttgtctgg caagaaaatt 120
accagtctgc tagctgaaat taaccgtaag ccagaagacc tggatgccat cttgattacc 180
catgagcatt cagatcatat ccatggagta ggcgttttgg ctgcgaagta tggatggat 240
ctttatgcca atgaaaagac ctggcaagct atggaaaata gtaaataatct tggcaagggtg 300

<210> 578
<211> 550
<212> DNA
<213> Streptococcus pneumoniae

<400> 578
ttgcacttta tatcctccat tattttgtct tttatatcag tgattatgga caggatttct 60
ttaaaggagg atatttgatt gaacttgtcc agacattgaa atatatccta ttctttgcac 120
tagcgattag tatttctaatt ttttcttag aggatcgatt tagtatttcc agacgaggca 180
tgatttactt cctcacatta catgctctct tagtctatgt gctaaacctt tttatcaagt 240
ggatattgaa gcgggcttat cccaacttta aagggaagta gaagattctc ctacttacag 300

caacttctcg tgtcgaaaag gtactggata gattaataga atcaaatgag gttgttgggg 360
 agttggtagc cgtcagtgtc ttagataaac cagattttca gcatgattgt ttaaaggtag 420
 tagcagaggg ggagatagta aactttgcga ctcatgaggt ggatgatgaa gtctttatca 480
 atcttccaag taaaaaatac aatattggag agcttgtctc tcagtttgaa acgatgggaa 540
 ttgatgtaac 550

<210> 579
 <211> 345
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 579
 aagtaggggc tttcttgcca aaaacatctt tggatgaact accacaattg tttaatattc 60
 ttgttggtta tatgagtatt gtaggtccta gaccagcggg tataaatgaa ctagatttga 120
 ttgcagagag agataagtat ggagcaaatg atatcttgcc agggttaact ggatgggcac 180
 aaattaacgg gcgtgatact ttgtctgttg agatgaagac ggagttagat ggctactatg 240
 ttaaacaatc gtctttgata atggatatta gatgtatagt taagacaata ccttacgtac 300
 tgaaacgaaa aggtattgta gagggtagtg gtaagaaaga aagtt 345

<210> 580
 <211> 600
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 580
 taacgagatt attacaaaac aaaactacta tcgtatttct tttcttggtta aaggaaaatt 60
 aagtaagata ttaggttatg taaaattcag aaaagaaatt aaaaagaagc taaaagaaaa 120
 tgattatgat atgatattgc cgttacatag tattgtgtct ttcatttttag tagattttct 180
 tctcttttca tttaaaaata gatataattt tgatattcgt gattacagtt atgaaaaatt 240
 tttggtttat cgtttggttc agaaacaatt ggtgaaaaat tctttaatga atactgtttc 300
 ttcagacggc tataaaatct ttttaccat gggagagtat tttactacc ataactacc 360
 caatatgata gaattaaacg aggtaaagca gttaaaaaat aatagtacgt ttccaattca 420
 actttcctac attggtttaa ttcgttttca agaacaaaat aaaaaataa tcgatttttt 480
 tgcaaatgac agtcgatttc agttgaattt tataggtagt aatgcaggag aattaaggga 540
 atttgtcaa gaaaaaaata tcagcaatgt taacttggtg gacacattcc agcctaaaga 600

<210> 581
 <211> 561
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 581
 gaaagaattg ggtgcaaagg tttatcatgt gcctctatta aggaaaaagc ctctacatca 60
 gtttctctct cttgctagaa taataaagaa aggagattat gatatagtgc attgccatgg 120
 ctataaatct gcaattggtc tgatcttato taaaataatt ggttgtaaaa ttagaattat 180
 tcatagtcat atggcttatg taacagaaaa cagttttcaa aaagtattgc gtaaattagt 240
 aacaattttg gtaaaaatct tagcaactca ttggtttgca tgtggggaag attcggctaa 300
 gtggttatat ggagagaaag cgtataaaga cggaaaaatt gaaattatct ttaatgcaat 360
 tgatttgaaa aagtatcaat ttttgtcaga tggtagagaa aaatgtcgta gagaattaga 420
 tgtgtcaaat aagttcgtat taggaaatat agctcgccta tcagatcaaa aaaaccaag 480
 ttatttatct aacgttttaa aagaactcat tttaatcaaa ccaaatgtta tttactcct 540
 agttggtaat ggtgaggatg a 561

<210> 582
 <211> 736
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 582
 gcttccatca aatcacttta cactactaat tcagatttgg atttaaattt atggattatt 60
 gctgataaag tttcggatag aaataaagaa aagataaata gattatcaaa acaatttgcg 120
 cagagagaaa ttaattggat agagaacggt gagatcccat ttaaattaca tttagatagg 180
 ggatcaatta gttcathtag cagattatct ctgggaagtg ttcttccatc ttcaatgagt 240
 aaagttcttt atcttgacag tgatattatt gttatggatt ctttacgaag tatttttgat 300
 attgatttta agggtaaaat tctctatggg gtgaatgata cttttaataa agaatacaag 360
 cagggtgttg gtataccaat tgacaagcca atgtttaatg ctggagttaa gcttattaat 420
 ttagagttaa ggagaaataa taacgtcgaa gaaagatttt tgcaagtaat tcaaaagttt 480
 aatggtacta tattacaagg agatttaggg gttttaaatg cagttttata taactcattt 540
 ggtgtacttc ctccagaata taattatatg accatatctg aagatttgac ttatgaagaa 600
 atgatagttt ttaaaaaacc aattaattat tattcaaaag aggaaattaa aaatgccaga 660

gaacgtatag tcttacgaca tttcacaact agttttttat caaaaagacc ttggcaagaa 720
ggcagtaatg ttgcac 736

<210> 583
<211> 525
<212> DNA
<213> Streptococcus pneumoniae

<400> 583
tggaagacct ttatcctgtc ttttaacagt tcctttcgtg aaaacaaata ttactcccaa 60
tcaaatatct tatttatcta taattccttt gattgttgga tttataataa tgatatttac 120
aactgatttc gttgtattat tactggcatg gtttctatth tttttatgga acttactaga 180
tgagtagat gggaacttag ccagatatcg ggagcaatac tcgaaggatg gaagtgtagt 240
agatgcaatg gctggctatg tagccatggt gttgacgtat ttcggtgcag gaatagtagc 300
tgctcattta aacgactcag atatctatat aattttgggt gcattatctg ggatttcatt 360
gatttttcca aggttagtga tgcataagta tatcaataca gtagctcaag atgagtctgt 420
gagtagcatt aaagataaat ctgattttta tactataaaa atactggctc taaacatgac 480
atcaattaca ggaattccgc aggttttact gctattaact atttt 525

<210> 584
<211> 596
<212> DNA
<213> Streptococcus pneumoniae

<400> 584
ctataatggt gagcgatatt tgtcacaaca gattgatagt attaggcttc aaacattcac 60
taattggacg ctttttatta gggatgatgg atcaaaagat aaaacaatag aagtaataca 120
gaggtattct aagatagatg atagaattag attcgttgaa aatccctcaa agtttcatgg 180
agcttattac aattttttta atctaattga atacgttaaa aacaattatc aatttgatta 240
ttactttttt tgtgatcaag atgatatttg gaaagagcac aagttagaaa tacagctggt 300
aagattttct aaagatgaca tgccagagat ggtttactct gatatgtcaa cgattgatgc 360
cagtaataat ttgatagata ttagtataaa taaaataatg gggattgaat taccgaacat 420
aaataatttg tattttattc atgcctatat ctgggggtgt actgcagggt ttaatcatgc 480
attgctagag atggttcctt cagttgatat tgataaagat tatttatata tagaaaaact 540
gtctcatgat aattattttg caaagtttgc actagagtat gggaagggtg tgttct 596

<210> 585
<211> 530
<212> DNA
<213> Streptococcus pneumoniae

<400> 585
cgtatcaagt cggcatthtc aaactttggg tatgcaaat aatttttggc tggcagagaa 60
tgtggaattt ctggaatttg gattacctcg aaatgatgat ttttttaaaa gtgaaaaaat 120
caaaaccaca aatataaaat ttagaacatt atttgatatc gatttagacg aactggtagt 180
tttgtatatg ccgacgttca gagatgatgg atcgttgaat gcctataatt tagattactc 240
gaaactaata catgtttttc aaaataaatt tagaaaaat gtaaaaatat tagttcgttt 300
tcatccaaat gttgattcta gttttataaa ttacaggat acagactgta taaatgtgtc 360
gacctattca aatcctcagg atctgatgat gagtgcagat gtgatgatta cggattattc 420
atcggcttct attgatthta tgttattaaa tcgtccagta tttctgtatt taccagatta 480
tcaaagttat gtgaatgata gaccattgga tgataacttt gataaattgc 530

<210> 586
<211> 380
<212> DNA
<213> Streptococcus pneumoniae

<400> 586
ggatatgcca gcaaaaacgt tagccagcaa agttcaagtg gctgtaccag ctgacactcg 60
tatcgtctca atctctgtca aggataaaca gccagaggaa gccagtcgta tcgctaattc 120
tctacgagaa gttgctgcag aaaagatcgt cgctgtaacg cgagtatctg atgtaacgac 180
actgaagaa gcgcgaccag ctacgactcc ctcttctcca aatgttcgac gcaattcctt 240
gtttggthtt cttggaggag cagtcgtaac agtaattgct gttctthttga ttgagttgct 300
cgacaccogt gtgaaacgtc ctgaagatat tgaagatgta ctgaaaattc cactthttagg 360
gctcgttcca gatthtgaca 380

<210> 587
<211> 290
<212> DNA
<213> Streptococcus pneumoniae

<400> 587
atcaacgact tccaccaata tcgcttgggc thttgcgcgt gcaggttaca aaacgttgct 60

gattgatgga gatattcgca attctgttat gttagggtgc tttaaagcaa gggataagat 120
 tacaggcctg acagaatttt tatcaggaac tacagaccta tcacaagggc tttgtgatac 180
 caatatcgaa aatctctttg taattcaggc tggctctgtg tcaccgaatc cgacagctct 240
 tcttcaaagt aagaatttca gtacaatgct tgaaaccttg cgtaaataatt 290

<210> 588
 <211> 507
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 588
 agattacact tttacagcta tctccctcag ctacttaacc agtattattg ttgccttttag 60
 gcaggaggga cttagtcaat ttatcttgat actaacagat gatagtttca atggttcggg 120
 actagaaatg catgaagttg cacctattac agctctcttt attctgtact atttgtacaa 180
 atattttata aaagaaaata gtttttcttc agtattttat aatatcttaa tagctctcat 240
 tattcttttt ttaagcctta aacgaatcgt tcttttgagt gtattaatta tcataccagt 300
 atttttggta atttattggg atgataaaaa agtaagtaaa ctagggaaag aacgaaaaat 360
 ttttaagttta ttaaataatct tttccttaat atttataaca ggaatattcc tttatgttta 420
 tagtgtaaaa tctgatttta tatatacatt tattcaagaa cataatatta attcgatggc 480
 tagaacagat ttatggaagg gagttga 507

<210> 589
 <211> 558
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 589
 tctggactct cgataattgg aataatgggt ttcttatatc taattatggt ccgtctatat 60
 ttatatgggt ttgctttcta attatttttc aaattactgg ttttatttta caaaaagtta 120
 gtatatatga tttttctgta tggatatctga ttttatctta tttttttatg tttggattaa 180
 ttttcaatga gtatatgggg tttcaaacaa ctctgctgtg gagccctagt aacttctata 240
 ataatagaaga attatttcat tcatataatt ttataaattg gattttggtt tgttattctg 300
 taggctattt atttttttat agtgatggaa aggtacatta tcattcagaa gtacaaaatt 360
 atcaggaaaa tgaagagaaa attttgtaca atgcgggtag gattttaaca ggagtgggct 420
 ttatttctag ggtaataact gattctaaaa cagtactagc agttagagcg gcgaatagct 480

attcagcata ttcagaggca gctagttcag gaataataga tgatttagga gtacttatgc 540
ttcctggtgt gttctcct 558

<210> 590
<211> 516
<212> DNA
<213> Streptococcus pneumoniae

<400> 590
acatttgta tagtttcctt gttgacaaaa ttgtcgtaca ggcctaaagt ggaggaatt 60
tcgcatgaag aattgaaaga aataaatcct tcaaagataa tctatgtcat tcttctgact 120
ctaaatcttg ttatgttatt tctttatata cgtgaaatc agaaagtagt attgttttca 180
ggtagaagtt tttctaatat tacagatttg ataagtaact ataggtacct atcttattat 240
tcaaatgaag tagaaaatcg tgtaagtgga atgattaatc aactatctaa aattattcca 300
gcgactacac ttatttcttt atatatattt atgaataatt attttataac taaacaaata 360
aagaaaaatt tcatttattt gattccaata gctatattct ttgtctatgc aatcattagt 420
ggtagtagat tgccccttat aaggtaggt gttggagctc tgttgatatt gtatatatac 480
tctgtgtacg ggagtcctaa atctcaactt accaaa 516

<210> 591
<211> 383
<212> DNA
<213> Streptococcus pneumoniae

<400> 591
ttttaacca ccaagttgac tttagcttga tgcgagagat tggtaagggt tttgcggaaa 60
aatttgctgc tactggcatt accaaggctg taaccattga agcgtcgggt attgccccag 120
ccgtttttac agctgaagcc ttaaacgttc ccatgatatt cgccaaaaaa gctaagaaca 180
tcaccatgaa cgaagacatc ttaactgctc aagtctactc ctttaccaag caggtgacca 240
gcaccgtttc tatcgtgga aaattcctct caccagagga caaggttttg attatcgacg 300
atttccttgc taatggccaa gctgctaaag gcttgattca aatcatcgaa caggccggtg 360
ccacagtcca agctatcgggt atc 383

<210> 592
<211> 723
<212> DNA
<213> Streptococcus pneumoniae

<400> 592
gtggatgctc aagaaactgc gggagttcac tataaatatg tggcagattc agagctatca 60
tcagaagaaa agaagcagct tgtctatgat attccgacat acgtggagaa tgatgatgaa 120
acttattatc ttgtttataa gttaaattct caaaatcaac tggcgggaatt accaaatact 180
ggaagcaaga atgagaggca agccctagtt gctggtgcta gcttagctgc tctgggaatt 240
ttaatttttg ctgtttccaa gaaaaagggt aagaataaaa cggattattaca tttagtattg 300
gttgcgggaa taggaaatgg tgtcttagtt tcagtccatg ctttagaaaa tcactttttg 360
ctaaattaca atacggacta tgaattgacc tctggagaaa aattacctct tcctaaagag 420
atctcaggtt acacttatat tggatatatc aaagagggaa aaacgacttc tgattttgaa 480
gtaagtaatc aagaaaaatc agcagccact cctacaaaac aacaaaagggt ggattataat 540
gttacaccaa attttgtaga ccatccatca acagtacaag ctattcagga acaaacacct 600
gtttcttcaa ctaagccgac agaagttcaa gtagttgaaa aacctttctc tactgaatta 660
atcaatccaa gaaaagaaga gaaacaatct tcagattctc aagaacaatt agccgaacat 720
aag 723

<210> 593
<211> 465
<212> DNA
<213> Streptococcus pneumoniae

<400> 593
attatcactg gcggaagac ccataattag gttttttctc gcacattggt gggaacggtt 60
gcatcatgca ggtaggacct gttgataatg gtgcctggga cgttgggggc ggttggaatg 120
ctgagaccaa tgcagcggtt gaactgattg aaagccattc aactaaagaa gagttcatga 180
cggactaccg cttttatata gaactcttac gcaatctagc agatgaagca ggtttgccga 240
aaacgcttga tacagggagt ttagctggaa ttaaaacgca cgagtattgc acgaataacc 300
aaccaaacaa cactcagac catgtggatc cataccctta cttggcaaaa tggggcatta 360
gccgtgagca gtttaagcat gatattgaga acggcttgac gattgaaaca ggctggcaga 420
agaatgacac tggctactgg tacgtacatt cagacggctc ttatc 465

<210> 594
<211> 452
<212> DNA
<213> Streptococcus pneumoniae

<400> 594
aatggaatga acggaagtga agctgctggt catgaagtgc cagaatacac aggcccatta 60
gggacatccg gcgaagagcc agctccaaca gtcgagaagc cagaatacac aggcccacta 120
gggacatccg gcgaagagcc agccccgaca gtcgagaagc cagaatacac aggcccacta 180
gggacagctg gtgaagaagc agctccaaca gtcgagaagc cagaatttac agggggagtt 240
aatggtacag agccagctgt tcatgaaatc gcagagtata agggatctga ttcgcttgta 300
actcttacta caaaagaaga ttatacttac aaagctcctc ttgctcagca ggcacttcct 360
gaaacaggaa acaaggagag tgacctccta gcttcactag gactaacagc tttcttcctt 420
ggtctgttta cgctagggaa aaagagagaa ca 452

<210> 595
<211> 526
<212> DNA
<213> Streptococcus pneumoniae

<400> 595
ggtcaactgt ccatatctcc tatttttcaa ggaggttcat atcaactgaa caataagagt 60
atagatatca gctctttggt attagataaa ttgtctggag agagtcagac agtagtaatg 120
aaatttaaag cagataaacc aaactctctt caagctttgt ttggcctatc taatagtaaa 180
gcaggcttta aaaataatta cttttcaatt ttcagagag attctggtga gatagggtga 240
gaaataagag acgccaaga gggaataaat tattttattt ctagaccagc ttcattatgg 300
ggaaagcata aaggacaggc agttgaaaat aactagtagt ttgtatctga ttctaaagat 360
aaaacataca caatgtatgt taatggaata gaagtgttct ctgaaacagt tgatacat 420
ttgccaattt caaatataaa tggtagatag aaggcaacac taggagctgt taatcgtgaa 480
ggtaaggaac attacctcg aaaaggaagt attggtgaaa tcagtc 526

<210> 596
<211> 506
<212> DNA
<213> Streptococcus pneumoniae

<400> 596
agtcgcacta gccacatatt tcttcgggtt gctagggacc agtacagtat ttgcagatga 60
ttctgaagga tggcagtttg tccaagaaaa tggtagaacc tactacaaaa agggggctct 120
aaaagaaacc tactggagag tgatagatgg gaagtactat tattttgatc ctttatccgg 180
agagatgggt gtcggctggc aatatatacc tgctccacac aaggggggta cgatcggtcc 240

ctctccaaga atagagattg ctcttagacc agattggttt tattttggtc aagatgggtg 300
 cttacaagaa tttgttggca agcaagtttt agaagcaaaa actgctacga ataccaacaa 360
 acatcatggg gaagaatatg atagccaagc agagaaacga gtctattatt ttgaagatca 420
 gcgtagttat catactttta aaactggttg gatttatgaa gagggttatt ggtattattt 480
 acagaaggat ggtggctttg attctc 506

<210> 597
 <211> 518
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 597
 atttcgagtg ttgcttatgg gcgccaagtc tatctcaagt tggaaaccac gagtaagagt 60
 gatgaagtag aggctgcttt tgaagctttg ataaaaggag tcaaggtagc tcctcagaca 120
 gagtggaagc agatttttga caatacagaa gtgaaggcgg ttatttttagg gggcgaccca 180
 agttcgggtg cccgagttgt aacaggcaag gtggatatgg tagaggactt gattcaagaa 240
 ggcagtcgct ttacagcaga tcatccaggc ttgccgattt cctatacaac ttctttttta 300
 cgtgacaatg tagttgcgac ctttcaaaac agtacagact atgttgagac taaggttaca 360
 gcttacagaa acggagattt actgctggat catagtgggtg cctatgttgc ccaatattat 420
 attacttggg atgaattatc ctatgatcat caaggtaagg aagtcttgac tcctaaggct 480
 tgggacagaa atgggcagga tttgacggct cactttac 518

<210> 598
 <211> 534
 <212> DNA
 <213> Streptococcus pneumoniae

<400> 598
 gggtaactat gcgacttctg cttcaagttc ttcatgggat ttagtagcaa ataactatct 60
 gaaaatgacc gacactggaa atgtaacacg aactgcagca catgaagatg cgatagcggc 120
 cgcttctgct aaaaatcaaa cagttgagtt tgataaagtt aacatagggtg gagaaagttt 180
 taaatacaga aatatagggg cttttttcga taagagtaaa atcacaacaa atgaagatgg 240
 aaaaaagct cctagtaa ataaaattgt atatataggc aaggggcaag accaagattt 300
 gataggtttg gatcttaggg gcaaaattgc agtaatggat agaatttata caaaggattt 360
 aaaaaatgct tttaaaaaag ctatggataa ggggtgcacgc gccattatgg ttgtaaatac 420

tgtaaattac tacaatagag ataattggac agagcttcca gctatgggat atgaagcgga 480
tgaagggtact aaaagtcaag tgttttcaat ttcaggagat gatggtgtaa agct 534

<210> 599
<211> 604
<212> DNA
<213> Streptococcus pneumoniae

<400> 599
gatcaacaag ctgaagaaga ctatgctcgt agatcagaag aagaatataa tcgcttgact 60
caacagcaac cgccaaaagc tgaaaaacca gctcctgcac caaaaacagg ctggaaacaa 120
gaaaacggtg tgtggtactt ctacaatact gatggttcaa tggcgacagg atggctccaa 180
aacaacggtt catggtacta cctcaacagc aatggtgcta tggctacagg ttggctccaa 240
tacaatgggt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 300
gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 360
tacaacggtt catggtatta cctcaacgct aacggcgcta tggcaacagg ttgggctaaa 420
gtcaacggtt catggtacta cctcaacgct aatggtgcta tggctacagg ttggctccaa 480
tacaacggtt catggtacta cctcaacgct aacgggtgcta tggctacagg ttgggctaaa 540
gtcaacggtt catggtacta cctcaacgct aatggtgcta tggcaacagg ttgggtgaaa 600
gatg 604

<210> 600
<211> 500
<212> DNA
<213> Streptococcus pneumoniae

<400> 600
gtgtcagcac aaattacgat taaccataaa aaagcgcgct atgttcggat tgagctagaa 60
ggctataatg ccctcagtct tgcagaagtt gaagttttct gctttatagc tacgaatgct 120
gaaacggcga cacaagtttc taagccagtt caaccaatca gtcagactcc tgtgaaggat 180
aaaacattga caattcaaca cagtggagct tacattgccc gctactccat aacttgggaa 240
gaagttccag tagataaaga tggaaaccaa gttgttcgta gtcattcttg ggaaggaagc 300
ggtcgcaacc agactgcagg ttttgcctc aacctcccaa tcaaagaaaa tatgagaaat 360
ctgcgagtta agattgagaa aaagacgggc ctactatgga atagatggca aacaatctat 420
gaaaacagac caatttttagc tcaacccac cgtaaaatta cccattgggg tacgacattg 480

aattccaagg tgagtgacga 500

<210> 601
<211> 419
<212> DNA
<213> Streptococcus pneumoniae

<400> 601
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tcagactcct gtgaaggata aaacattgac aattcaacac agtggagctt acattgcccg 180
ctactccata acttggaag aagttccagt agataaagat ggaaaccaag ttgttcgtag 240
tcattcttgg gaaggaagcg gtcgcaacca gactgcaggt tttgtcctca acctccaat 300
caaagaaaat atgagaaatc tgcgagttaa gattgagaaa aagacgggcc tactatggaa 360
tagatggcaa acaatctatg aaaacagacc aatttttagct caacccacc gtaaaatta 419

<210> 602
<211> 401
<212> DNA
<213> Streptococcus pneumoniae

<400> 602
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taatgtgagt acaagcgaca tcagaagact caatattcca agtaatgtta catctggtgt 180
aattgttcgt tcggtacaaa gtaatatgcc tgccaatggt caccttgaaa aatacgatgt 240
aattacaaaa gtagatgaca aagagattgc ttcatacaaca gacttacaaa gtgctcttta 300
caaccattct atcggagaca ccattaagat aacctactat cgtaacggga aagaagaaac 360
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<210> 603
<211> 690
<212> DNA
<213> Streptococcus pneumoniae

<400> 603
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gaaggagtta ctgtttttcg ttcctataca attccaaggg gaaaaagtac ttacatagg 180
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agtccatcat ttaagaatta ttttgtgaac caatttgaca taacagaaca aaagattact 540
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aaagctgcca gtttgataga gaagaatacc 690

<210> 604
<211> 588
<212> DNA
<213> Streptococcus pneumoniae

<400> 604
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gctttgttag atatagttac gggagtatct tatgtcttta atggtttgtc tcagcaactc 180
tatttggtcg tgggaattct agtttttaggc tactggaatg ctgatgtgat tgttcattat 240
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<210> 605
<211> 739
<212> DNA
<213> Streptococcus pneumoniae

<400> 605
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tttttgtaa taataatcaa gttatttatt ggatccagat gttgtatgtg atttctgctg	360
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<210> 606
 <211> 533
 <212> DNA
 <213> Streptococcus agalactiae

<400> 606	
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cttgaacgtc atttatggag ttgtaattat tttaatcatt ttagcaagtt tatttctttg	180
tattaagaat aaagctagaa tttttacaac tataatttta gtactatcct ctattttcgt	240
tgctactact ttatatggat ttaagtcaac cattgatattg acaaataatc taaataaaac	300
tgcttcatac tctgaaattg agatgagtgt agttgtacca aaagattcta aaataaccaa	360
tatagaagct gtcagcaaat tagccgcacc agttaaaaac gatacttcaa atattactga	420
tttgatagaa catataaat cagaaaaagg aatctctatt acaccacaaa aaacagattc	480
ttaccaggat gcatacaata gaattaaaaa tgggtgatagt caagctatgg ttt	533

<210> 607
 <211> 510
 <212> DNA
 <213> Streptococcus agalactiae

<400> 607